

**MAXX-2400HD™**  
**High Definition Video Server**  
P/N 700-119-000x

**Operations Manual**  
Rev 7 August 2009  
Software version 1.03.515





# Contents

<b>Preface</b>	<b>9</b>
Software and Operations Manual Revisions .....	9
<b>Safety Notices</b>	<b>10</b>
Safety Terms and Symbols .....	10
General Safety Caution.....	10
Personal Injury Precautions .....	10
Product Damage Precautions.....	11
Product Registration .....	11
Product Improvements and Upgrades .....	11
Trademarks .....	11
Software Copyrights .....	11
Video and Audio Copyright Reminder .....	11
<b>Introduction</b>	<b>12</b>
Key Features and Benefits .....	15
Applications for 360 Systems Servers .....	16
Accessory Information .....	17
<b>Installation</b>	<b>18</b>
Unpacking .....	18
Important Installation Notes .....	19
System Cooling.....	19
Power Conditioning .....	19
About Server Software .....	21
Rack Mounting.....	22
Mounting an Audio Module (AXP-3, AXP-4 or DXP-1).....	22
Mounting the Control Module (CXP).....	22
Connecting the Monitor, Mouse and Keyboard .....	23
Installing the Hard Drives.....	23
Rear Panel Connections.....	24
Audio Module Connections .....	27
The AXP-3, AXP-4 and DXP-1 .....	27
Control Module (CXP) Connections.....	27
Serial Control Ports for Channels 1, 2, 3 & 4 .....	28
GPI Control .....	28
<b>Basic Operations</b>	<b>29</b>
The Server Desktop .....	29
Launching the Graphic User Interface.....	29
Shutting Down the Server.....	29

Graphic User Interface Overview .....	30
System Menu Bar .....	31
Show Menu .....	31
Edit Menu .....	31
Windows Menu .....	31
Help Menu .....	32
The Status Bar .....	32
The Transport Channel View .....	33
Transport Menu Bar .....	33
Options Menu .....	34
The Playlist Channel View.....	35
Playlist Menu Bar .....	35
Options Menu .....	36
Initial System Configuration .....	37
Selecting a Sync Reference .....	37
Setting the Video Sync Source .....	37
Making a Recording from the GUI .....	39
Record Configuration Options.....	39
Setting the Video Bit Rate.....	39
Setting the Audio Input Source .....	40
Arming Audio Tracks .....	40
Setting an Audio Delay Time.....	40
Audio Rate Conversion .....	41
Setting VANC Line Selections.....	42
Selecting a Time Code Source .....	42
Beginning Recording.....	42
Making a Crash Recording.....	43
Making a Named Recording.....	43
Monitoring a Recording Source with E-E Mode .....	44
Playing a Clip from the GUI.....	46
Beginning Playback.....	46
Looping a Clip .....	46
Pausing a Clip.....	46
Ejecting a Clip.....	47
Using Jog.....	47
Using GO-TO .....	47
Using Fast Forward / Rewind.....	47
Slow Motion Playback.....	47
Using Shuttle to Control Playback Speed .....	47
Editing a Clip.....	49
Using Edit While Recording .....	49
System Configuration.....	51
Assigning Names to the Server and Transport Channels.....	51
Programming GPIO Outputs .....	52
Programming GPI Inputs .....	53
Configuring the Ethernet Network .....	54
Setting the Date and Time .....	56

Clip Navigator .....	57
Renaming and Deleting Clips .....	57
Sorting Clips .....	57
Filtering the Clip Display.....	57
Finding Clips .....	58
Finding Clips Using Wildcards .....	58
Finding Clips Using Regular Expressions.....	59
Using Playlists .....	60
The Playlist View .....	61
Creating and Running a Playlist .....	62
Loading a Playlist (FILE > OPEN).....	63
Saving a New Playlist (FILE > SAVE AS).....	63
Saving an Existing Playlist (FILE > SAVE).....	63
Setting a Start Time for a Playlist.....	63
Stopping a Playlist (STOP) .....	64
Pausing Playlist (PLAY/PAUSE) .....	64
Cueing Clip (CUE).....	64
Looping Playlist (LOOP [X] ) .....	64
Showing First Frame of CUED Clip (SHOW) .....	64
Preparing Next Clip for Playback (NEXT) .....	64
Jumping to Selected Clip (JUMP) .....	64
Scrolling to Currently Playing Clip (HOME) .....	64
Set Maximum Number of Items to Keep.....	65
Enabling As-Run Logging.....	65
Viewing, Editing and Archiving Playlists .....	65
Editing Playlists.....	65
Removing Clip from a Playlist .....	65
Removing Clips Above or Below the Selected Clip .....	66
Inserting HOLD Into a Playlist .....	66
Appending a Playlist (FILE-> APPEND) .....	66
Changing Duration of Clips in Playlist .....	66
Mapping GPO to Playlist Events .....	67
Mapping GPI to Control a Playlist.....	68
<b>Advanced Topics</b> .....	<b>69</b>
System Timing .....	69
Using Embedded Audio .....	70
Using Audio Sample Rate Conversion.....	70
Ganging Channels for Synchronized Playback .....	71
Combined Video and Graphics Capabilities.....	72
Importing TARGA Graphics Files.....	72
Animation Import (.mov files) .....	72
Still Frames .....	73
FTP File Transfers.....	74

<b>Network Time Protocol</b>	<b>78</b>
Automatic Date/Time Updates.....	78
Connecting to the Network .....	78
Configuring NTP.....	79
Selecting the Time Zone.....	79
<b>Automation Control</b>	<b>82</b>
Remote Serial Control .....	82
Configuring the Automation Interface .....	83
Other Automation Options.....	85
Tested Automation Controllers .....	87
Tested Remote Control Panels and Switchers .....	87
<b>Remote Workstation Interface</b>	<b>88</b>
System Requirements .....	88
About the Remote Workstation Interface.....	89
Operations.....	89
Installation .....	90
After Installation.....	90
Hard Disk Management.....	91
About RAID 6 .....	92
Improved Write Performance .....	92
Managing Disk Arrays.....	93
Error Notification and Repair .....	93
Log-In to the RAID Utilities .....	95
Determining the Condition of the RAID Array.....	96
Displaying the Alarm Log of the Raid Array .....	97
Checking Status of the Drives .....	98
Removing the Degraded Drive from the RAID Unit.....	99
Rebuilding the RAID Array .....	100
Replacing Hard Drives .....	101
RAID Controller Settings .....	102
Multi-Channel Audio .....	103
Audio Input/Output Modules.....	103
DXP-2 Digital Audio Module.....	103
DXP-2 Technical Specifications .....	104
AXP-3 Analog Audio Module .....	104
AXP3/AXP4 Technical Specifications .....	105
<b>Maintenance</b>	<b>106</b>
Fault Diagnostics .....	106
Front Panel Indicators.....	106
Gigabit Ethernet Indicators .....	107
Access To Components.....	107
Opening the Front Panel .....	107
Removing the Top Cover.....	107
General Handling Precautions.....	108
Installing/Removing I/O Cards .....	108
Software Updates From CD-Rom.....	109
Program Updates from USB Memory .....	110

Updating Firmware.....	111
Replacing a Hard Drive .....	113
Factory Repair Policy.....	113
Regulatory Certifications.....	114
Safety .....	114
Radio Interference Compliance .....	114
<b>Product Warranty</b> .....	<b>115</b>
<b>End User License Agreement</b> .....	<b>116</b>
<b>Appendix A</b> .....	<b>118</b>
Connector Specifications .....	118
Audio XLR-3 Connector Pinout.....	118
Serial Control Connector Pinout .....	118
BNC Connectors .....	119
GPIO Connectors.....	119
GPI Connector Pinout .....	119
System Board Ports .....	121
<b>Appendix B</b> .....	<b>122</b>
Serial Command Protocols.....	122
VDCP Command Table.....	122
P2 Serial Command Table .....	124
Odetics® Protocol .....	125
<b>Appendix C</b> .....	<b>128</b>
Technical Specifications.....	128
Keyboard Shortcuts.....	129
<b>Appendix D</b> .....	<b>130</b>
Playlist Management Detail .....	130
<b>Appendix E</b> .....	<b>133</b>
As-Run Logging Detail .....	133
As-Run Naming Convention .....	133
Sample As-Run Log.....	133
As-Run Log Page Header .....	134
As-Run Log Body .....	134
<b>Appendix F</b> .....	<b>135</b>
Mechanical Drawing .....	135
<b>Index</b> .....	<b>136</b>





# Preface

This manual provides installation, setup and operating instructions for 360 Systems' MAXX-2400HD video server. It is organized to provide quick access to topics of primary interest. An extensive Table of Contents is provided at the beginning, and a subject Index at the end, to assist in locating information.

If you have already used other video servers or VTRs, you may find discussion of the basic server to be covering familiar topics. However, it is strongly recommended that engineering managers and staff members operating the server read through this manual. Being familiar with its operation can prevent operational mistakes, and will make all users aware of important set-up and maintenance issues.

## Software and Operations Manual Revisions

Software revisions are released from time-to-time that introduce new product features, or improve the performance of the product. When such revisions are shipped as a CD-ROM, printed operational notes are included. When revisions are introduced in the course of product production, an updated Operations Manual will be shipped with new servers.

The title page of an Operations Manual indicates its revision number, which should always match the software revision of the server with which it is used. Operations Manuals for the latest revision may be obtained from 360 Systems Customer Service, or from 360 Systems' web site.

Your comments are welcome. If anything in this manual seems unclear, please let us know by sending an email to [support@360systems.com](mailto:support@360systems.com).

## Typographical Conventions

The following typographical conventions are used to clarify meaning:

- Connector or indicator labeling that appears on the unit is shown in **Arial Narrow Bold**.
- GUI menu items are shown in **Arial Bold**.
- Text typed into the GUI and Key Commands are shown in **Courier Bold**.
- GUI sub-menu paths are shown by the > symbol.

# Safety Notices

## Safety Terms and Symbols

THE FOLLOWING WARNING SYMBOLS ARE USED IN THIS MANUAL:



ENGLISH	ATTENTION: REFER TO OWNER'S MANUAL FOR IMPORTANT INFORMATION.
FRANÇAIS	ATTENTION: VEUILLEZ VOUS RÉFÉRER AU MODE D'EMPLOI POUR UNE INFORMATION IMPORTANTE.
ITALIANO	ATTENZIONE: FATE RIFERIMENTO AL MANUALE PER INFORMAZIONI IMPORTANTI.
ESPAÑOL	ATENCIÓN: FAVOR DE REFERIR AL MANUAL DE OPERACION POR INFORMACION IMPORTANTE.



ENGLISH	WARNING: ELECTRICAL SHOCK HAZARD.
FRANÇAIS	AVERTISSEMENT: DANGER DE CHOC ÉLECTRIQUE.
ITALIANO	AVVERTIMENTO: PERICOLO DI SHOCK ELETTRICO.
ESPAÑOL	ADVERTENCIA: PELIGRO DE CHOQUE ELECTRICO.

## General Safety Caution

- Heed the following important cautions regarding the server in order to avoid personal injury or equipment damage.
- Only qualified personnel should perform installation and service. Refer to appropriate sections of this product manual for instruction. Contact 360 Systems Customer Support for further explanation, or to clarify any uncertainty.
- Disconnect the power cord before removing the cover.

## Personal Injury Precautions

To avoid electric shock, do not operate this product with covers removed.

To avoid risk of fire, replace the power cord only with same type and rating as specified. Replace damaged power cords immediately.

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, do not remove or modify the contacts on the plug.

Prevent the power cord from being walked on, pinched, or abraded.

To reduce the risk of fire or electric shock, do not expose this unit to rain or moisture.

Remove jewelry such as watches or metallic necklaces before servicing this equipment.

## Product Damage Precautions

- 360 Systems' MAXX-2400HD™ server contains hard disk drives and other fragile electronic and mechanical devices. While designed to be very reliable, it is still vulnerable to shock. Handle with care, and exercise caution not to drop or bump the server as damage to internal components may result. Always turn off power before moving the server.
- Do not obstruct air vents. Maintain an ambient temperature below 30°C (86°F).
- Clean only with a soft cloth dampened with water. Do not spray cleaners or solvents directly on the product.



### CAUTION:

Replace the motherboard battery only with the same, or equivalent battery type. Follow all local laws regarding the disposal of BR and CR Lithium batteries. Batteries should be fully discharged prior to disposal.



### CAUTION:

Never use disconnect AC power to shutdown the server. Doing so may cause errors in the hard disk array. Should this happen, the array can be reinitialized without any data loss; however, the process may take several hours. Shutdown the system only by momentarily pressing the front panel power button, or through the On-Screen user interface.

## Product Registration

**Important:** As the owner of new capital equipment, you will want to take advantage of product information, enhancements, upgrades, or notifications issued by 360 Systems. Send in your Warranty Card so 360 Systems can remain in contact with you. Mail or fax it to 360 Systems offices in the USA at the address given below.

## Product Improvements and Upgrades

360 Systems reserves the right to make changes and/or improvements to its products without incurring any obligation to incorporate such changes or improvements in units previously sold. Certain features mentioned in this document may not be present in all models. This product is not offered for sale in all countries.

## Trademarks

MAXX, Image Server, Multi-Format server, 360 Systems®, 360 Systems Broadcast and Bit-for-Bit® are trademarks or registered trademarks of 360 Systems in the U.S. and/or foreign countries. Other trademarks referred to in this document are the property of their respective owners.

## Software Copyrights

Software in this product is based on the work of, or is copyright by, 360 Systems, SuSE® GmbH, Trolltech, and FreeType Team. Copyright 2003-2009 by 360 Systems.

## Video and Audio Copyright Reminder

It is illegal to use this product to make copies of copyrighted material without the express permission of the copyright holder.

# Introduction

360 Systems' MAXX-2400HD™ server is a four channel, high-definition video recorder/server designed for broadcast, production, and Pro A/V applications. It can play four independent video streams at once, and stores approximately 240 hours of JPEG-2000 encoded video<sup>1</sup> with eight audio channels per video stream. It occupies just 5¼" of rack space. The server's extensive feature set makes it an excellent choice for VTR replacement, broadcast automation, remote trucks, corporate, educational, house-of-worship, and live entertainment presentations. MAXX-2400HD can be operated at high definition line rates of 720p or 1080i.

## Seamless Installation in New Facilities

The MAXX-2400HD smoothes installation in a new setting, providing both HD-SDI video and composite monitoring outputs. Program file transfers are also available over Gigabit Ethernet. It's never necessary to add outboard encoders; premium-quality JPEG-2000 codecs are included as standard equipment.

All professional audio formats are available with MAXX-2400HD. For surround sound, eight channels of embedded audio are included.<sup>2</sup> Optional multi-channel audio modules provide 8 channels of AES/EBU digital audio (Model DXP-1); and either 4 or 8 channels of +4 balanced analog audio (Model AXP-3 and AXP-4).

MAXX-2400HD's versatile video and audio I/O personality is unique among HD servers, and guarantees a seamless fit in existing facilities, and as part of new build-outs.

## Exceptional Storage Capacity

The MAXX-2400HD contains twelve 1-Terabyte drives in its compact enclosure, providing 240 hours of storage with exceptional image quality. Storage time varies proportionally at other data rates, as illustrated in the chart below.

The server's RAID-6 disk array provides a high level of security for stored program content, by spreading parity information across all drives. It also helps keep the server in service, even in the event two drives were to fail. The multi-drive array also helps generate the data rates required for multiple streams of high definition video.

Capacity, net of RAID-6	Time @ 50 Mb/s	Time @ 80 Mb/s	Time @ 100 Mb/s
10.0 TB	365 hours	240 hours	200 hours

MAXX-2400 STORAGE TIME VS VIDEO DATA RATE

<sup>1</sup> At 80 Mb/sec data rate

<sup>2</sup> Per video stream

## Compatibility with Automation Controllers

MAXX servers work with automation controllers from many different manufacturers, accepting VDCP, Odetics or BVW protocols for 9-pin control of each server channel. 360 Systems' business partners provide automation controllers for applications ranging from affordable systems for Pro-AV, up to large-scale broadcast solutions. Contact a 360 Systems application engineer or an automation provider for assistance with your requirements.

## Remote Controls

Hardware accessories are available from third-party manufacturers to perform transport control, instant clip replay, slow-mo, and automation. A table of tested controllers is provided elsewhere in this manual. Contact 360 Systems Sales Support team for assistance with a specific application.

The MAXX-2400HD server provides twelve GPI inputs for remote play, stop, and record capability from push-button panels or other GPI-controlled equipment. Twelve outputs are also provided; these may be used for command acknowledgement (to drive LEDs or logic inputs), or they can output at specific times programmed within a Playlist that is resident on the server.

## Better Images with JPEG 2000

JPEG-2000 has distinguished itself for visually lossless encoding of images, and almost complete freedom from visual artifacts. It sets a new level of image quality for High Definition, well-suited for production and broadcast. It's a first choice for many new cameras and servers, and its easy-to-edit I-frame format is accepted by an increasing number of NLEs. The MAXX-2400HD runs at a wide range of video rates, making it an excellent choice for production, broadcast, and even high-quality projection.

## Audio Features

MAXX-2400HD provides most standard professional audio formats, making it an easy fit in a new facility. Eight embedded audio channels are standard equipment for each video stream. Analog audio is expandable to 4 analog channels with the AXP-3 module, and up to 8 analog channels with the addition of an AXP-4 module. Eight channels of AES/EBU digital audio are alternatively available with the optional DXP-1 module. Gold XLR connectors are standard for audio inputs and outputs.

360 Systems brings extensive experience in broadcast and pro-audio to the design of video servers. Their 24-bit word size delivers a 20 dB improvement in SNR (10 times) compared with older 16-bit audio systems. Input circuits provide excellent hum and RF rejection, and 20 dB of headroom. 360 Systems' Bit-for-Bit® design strategy assures that Dolby®-E, Dolby AC3, or other forms of encoded audio will be stored and played correctly.



## **The Graphic User Interface**

The MAXX-2400HD incorporates a graphic user interface (GUI) which gives fast access to every server function. It is controlled by a standard keyboard and mouse (supplied) and requires only a VESA-compliant SVGA display. The full GUI is also available from remote workstations.

The GUI displays a control panel for each server channel; these include transport control, clip management, head and tail trimming, and playlisting. The GUI can easily operate the server's four channels without the need for other equipment.

System configuration is clear and straightforward through the GUI. It provides access to encoding parameters, audio options, and time-code settings. Whenever new server features are installed, new set-up parameters and user-interface features become immediately available.

The server comes with Remote Workstation Software, which allows it to be remotely operated from a standard PC over Ethernet; the GUI is replicated at each remote location. Separate work areas can be easily created within a building for ingest, trimming, playlisting, system monitoring or play-to-air.

## **File Transfers over Gigabit Ethernet**

The MAXX-2400 goes beyond just base-band connections for video and audio. File transfers over Gigabit Ethernet allow the transfer of video content across the room, or across the country, at high speed and low cost. With Ethernet switches and broadband connections, the server's design enables low-cost networking of broadcast operations from ingest to storage, for editing, play-to-air and archiving.

## **Reliability Counts**

360 Systems has 37 years experience manufacturing equipment for television broadcast and other industries that require elevated reliability. With more than 30,000 hard disk products in service around the world, we understand quality, reliability, and protecting your stored content.

## Key Features and Benefits

The MAXX-2400HD is designed from the ground up to deliver outstanding performance and value as a high-definition broadcast server. Two inputs, four outputs, a Gigabit Ethernet port, and multiple audio formats make it an excellent and affordable choice for the transition to high definition.

- Four simultaneous video outputs, or two input and two outputs
- HD-SDI video inputs and outputs
- Composite video monitoring outputs
- Eight channels of embedded audio (standard)
- Optional 4 channel analog audio input/output expander available (AXP-3, Channels 1-4)
- Optional 4 channel analog audio input/output expander available (AXP-4, Channels 5-8\*)
- Optional 8 channel AES/EBU digital audio expander available (DXP-1)
- 12 Terabyte internal RAID-6 drive array for 240 hours of storage
- Slow-Motion playback forward and reverse
- Key-and-Fill playback
- Targa file import via Ethernet
- MOV file import and rendering
- Serial control via VDCP, BVW or Odetics protocols
- Compatible with leading broadcast automation systems
- FTP transfers over Gigabit Ethernet
- VITC (ATC) time code
- Closed-Captions
- Accurate head and tail trimming, and program segmenting
- Advanced Playlisting: Build, edit, store, playback, and loop 4 simultaneous lists
- Looping
- Keyboard shortcuts for editing
- Server control with familiar Graphic User Interface (GUI)
- Remote Workstation Software creates up to four remote worksites
- Compact 5¼" [133 mm] enclosure
- Redundant power and cooling
- Attractively priced

---

\* AXP-4 requires AXP-3.



## Applications for 360 Systems Servers

The MAXX-2400HD adds value to many applications in broadcasting, cable distribution, video production, Pro A/V, entertainment and sports. It provides immediate record and playback of any source, lending a spontaneous appearance to broadcasts, presentations and live events.

- News Production – Promos, teasers, intros, news segments, graphics, animation
- Play-to-Air server – Playback under automation control
- Graphics server – Play TARGA files with key-and-fill (available Q2-2009)
- Master Control – Program and commercial playout, station IDs, promos, teasers
- Program Ingest – Automated capture of satellite, tape, microwave, and fiber feeds
- FTP File Delivery – Deliver news, promos, spots over broadband lines
- Program Store-and-Forward – Temporary storage for subsequent delivery
- Commercial Insertion – Playout under automation control
- Instant Replay – Hot Key playback of sports plays, news clips, stills, and graphics
- Sports Shows and Events – Slow-motion playback, player bios, graphics, promos
- Game Shows – Prizes, graphics, animations, promos
- Talk and Variety Shows – Promos, teasers, intros, outros, graphics, animations
- Award Shows – Nominees, categories, promos, graphics, animations
- Theme Parks and Casinos – Playout for show backgrounds, event lists, kiosks
- Houses of Worship – Projection displays, program production, broadcasting
- Colleges and Universities – On-campus networks, production, presentations
- Digital Signage – drive projectors, flat-panel displays, kiosks
- Entertainment Industry – Road show displays, projection
- Mid-market Broadcasting – High performance at an attractive price
- Synchronized two-channel playback for 3D video



## Accessory Information

### **AXP-3 Multi-Channel Analog Audio Module** (optional – provides channels 1-4)

Provides 4 analog audio outputs for each of 4 server video outputs, and 4 analog audio inputs. +4 dBu balanced on XLR connectors. Redundant power supply. 3½" [88 mm] height.

### **AXP-4 Multi-Channel Analog Audio Module** (optional– provides channels 5-8)

Provides 4 analog audio outputs for each of 4 server video outputs, and 4 analog audio inputs. +4 dBu balanced on XLR connectors. Redundant power supply. 3½" [88 mm] height. Requires AXP-3.

### **DXP-1 Multi-Channel Digital Audio Module** (optional)

Provides 8 AES/EBU digital audio outputs for each of 4 video streams, and 8 AES/EBU inputs on XLR connectors. Redundant power supply. 3½" [88 mm] height.

## Maintenance Spares

360 Systems is committed to keeping your server on air. Having spare parts on hand in the event of a fault is a good practice in broadcast and other high-reliability applications. Hard disk spares are particularly important. Please consider these options at the time of your purchase, or shortly after.

- 1-TB server-grade hard drive
- MAXX-2400HD plug-in power supply module

# Installation

## Unpacking

Your server has been carefully inspected and calibrated before shipment to allow immediate operation upon installation. Check all items for signs of visible damage which may have occurred during shipment. If any item is damaged, contact the carrier to file a claim.

Keep the packing materials in the event that a unit must be returned. If the original packaging is not available, due to the product's weight it should be professionally packed for shipment, with particular attention to protecting the corners.

### **CAUTION!**

The MAXX-2400HD server weighs more than 90 pounds [40 kg]. Always use safe two-man lifting techniques when handling it.

## Package Contents

Confirm that all items on the packing list have been received. Contact 360 Systems if any item is missing.

- ✓ MAXX-2400HD server
- ✓ Keyboard
- ✓ 2-Button Scroll Mouse.
- ✓ Software CD-ROM (backup copy)
- ✓ Remote Workstation Software CD
- ✓ CXP serial control and GPI module
- ✓ CXP interface cable
- ✓ Rack Mount Hardware Kit
- ✓ Operations Manual and Warranty Card
- ✓ Power cords (2)

### **STOP**

Before unpacking hard drives, refer to the following sections on RACK MOUNTING (Page 19) and INSTALLING THE HARD DRIVES before unpacking the drives.

The server is not shipped with a video monitor. Select a VESA-compliant CRT or LCD monitor with a minimum refresh rate of 75 Hz.

## Important Installation Notes

### System Cooling

When many pieces of equipment are mounted in an equipment rack, a considerable amount of heat may be produced, which must be removed efficiently. Further, a lower operating temperature will make equipment operate more reliably, and it will last longer. In the extreme case, excessive temperatures cause rapid equipment failure, and damage which can be difficult to repair.

Heat in an equipment rack must be removed by forced air. This is often accomplished by blowers installed in the top of the rack, venting into the room. An alternative is to draw hot air from the top of the rack into an air-conditioning return duct, and not vent it into the equipment room. Cold air should be ducted into the bottom of the rack.

The optimum air temperature for cooling electronic equipment is 25° C (72° F). When many pieces of equipment are contributing to the heat load, a substantial air-flow will be needed, and the inlet temperature may need to be lower.

### Check These Points

- Are the ventilation holes in the server free of obstruction?
- Can blowers or HVAC system adequately remove heat from the equipment rack?
- Have you measured the actual temperature inside the rack? Do this near the top.
- Verify that the HVAC system is not on a timer that can shut off on weekends or holidays.
- What procedures are in place to protect the equipment when the HVAC system fails?

### Power Conditioning

It is good practice to operate an on-air video server from an Uninterruptible Power Source, or UPS. All utility power systems experience occasional transient events, including brownouts and dropouts, which are capable of taking a server off the air. It is the station operator's job to plan for and overcome such contingencies.

UPS units suitable for smoothing short-term power line problems come in two varieties:

### Change-over UPS Design

This design senses drop-outs and low line voltage, and switches its output to an internal inverter operating from a battery. This UPS is low in cost, and is most often used in non-critical applications such as desk-top computers. A disadvantage is that it may create its own power transients when switching between utility power and its inverter supply. For this reason, 360 Systems does not recommend this type for use with a broadcast server.



## Continuous Conversion UPS Design

This improved design, sometimes called 'double conversion' continuously converts utility power to DC, stores it in a battery, then produces isolated AC power from an inverter. It never switches back and forth to utility power, and has better immunity to input transients, brownouts, and blackouts. Models are available with batteries of almost any size, making the continuous-conversion UPS suitable for transient suppression or long-term operating power in the absence of utility power.

## Recommended UPS Models

The following makes of continuous conversion UPS systems can be considered for use with 360 Systems' server products:

APC Smart-UPS 2200-XL

Eaton/Powerware Corporation, Model 9125, [www.powerware.com](http://www.powerware.com). This product is available in several configurations to accommodate different current load and power failure support times.

The minimum requirement for the MAXX-2400HD server is 3 amps.

## Server Operating Environment

A video server is the most critical element in a broadcast operation. Its installation should safeguard it from every external event that can interfere with it doing the task expected of it. 360 Systems' engineers have experience with thousands of installations, and have become aware of a number of environmental factors that can adversely affect performance. Two of these have already been discussed: power conditioning and inadequate cooling. Two others, less obvious, should also be considered:

## RF Interference by Cell Phones

Many people are not aware that cell phones produce a very high instantaneous power output, even when no conversation is taking place. You may have experienced the effect of a cell phone interfering with a common desk phone placed nearby. Carrying a cell phone into a machine room where it is in close proximity to broadcast equipment and its associated wiring is unwise. Cell phones can interfere with serial control commands, video synchronization, and in some cases can crash the CPU in equipment.

Some major broadcasters prohibit the presence of cell phones in certain equipment areas. 360 Systems believes that the risk of undesired equipment behavior from their RF fields is very real.

## Static Discharge

Static electricity discharge is accepted by most people as an inevitable consequence of living in a dry area. It is also a result of floor coverings that may enhance appearances, but are inappropriate for use around critical broadcast equipment. Static discharge can do two adverse things:

- Discharge into a connector can—and will—destroy internal circuitry of equipment. The result will usually be difficult to diagnose.
- Discharge to equipment frames or wiring can crash a CPU and take the station off the air. The event may seem random or unrelated to static, but it is clearly a catastrophic event—and one that can repeat indefinitely.

Several steps can be taken to protect equipment from static discharge:

- Do not install critical broadcast equipment (video servers) in a room with carpeting.
- Connect equipment racks directly to the utility safety ground with a heavy copper conductor.
- Do not operate equipment which has a lifted safety ground (green frame ground wire).
- Consider installing a humidifier to reduce the likelihood of static discharge.

## About Server Software

The MAXX-2400HD is shipped with its application programs and operating system installed. The first time that it is started, it must be connected to a keyboard, monitor and mouse. The server will ask you to accept the Software Licensing Agreement before it will operate. This screen will only appear during the initial startup. Refer to the Maintenance chapter of this manual if it becomes necessary to reinstall software.

## Rack Mounting

### CAUTION!

It is strongly recommended to rack mount the MAXX-2400HD before installing the drives. This will reduce the weight significantly, and simplify the mounting process.

In North America, the rack slide rails will be mounted in a 19" rack enclosure having 10-24 or 10-32 tapped holes. In countries with metric standards, the user will need to supply appropriate fasteners.

Install the included rack mount slide rails in the rack. They must be securely mounted at both the front and back of the rack. Extend the slides in the slide rails. Carefully mate them with the rails on the sides of the MAXX-2400HD – **this process requires at least two people** unless an adjustable lift is available. Slide the MAXX-2400HD into the rack.

Deploy the front panel to expose the rack screw slots. Unscrew the knurled fasteners and pull forward and down to deploy the front panel. Fasten the MAXX-2400HD into the rack using appropriate flat-head screws (#10 Phillips screws provided in North America). Retract the front panel. Tighten the front panel access screws.

Cables attached to the rear of the MAXX-2400HD should be supported. Do not suspend substantial cable weight from the server.

### Mounting an Audio Module (AXP-3, AXP-4 or DXP-1)

An optional multi-channel audio module may also be rack mounted above or below the MAXX-2400HD, on the front or rear of the rack. Four elongated screw holes are provided to facilitate rack mounting of the AXP Module. Audio modules are connected to the server with the supplied 68 Pin cable. Connect one end to the mating connector on the rear of the audio module. Connect the other end to the rear panel of the server.

### Mounting the Control Module (CXP)

The supplied CXP module may also be rack mounted above or below the MAXX-2400HD, on the front or rear of the rack. Four elongated screw holes are provided to facilitate rack mounting of the CXP Module. The CXP module is connected to the server using the supplied 68 Pin cable. Connect one end of the cable to the mating connector on the rear of the CXP Module. Connect the other end to the rear panel of the server. Refer to Figure 5 on page 28 for information about connecting GPI and automation signals to the CXP Module.

## Connecting the Monitor, Mouse and Keyboard

The MAXX-2400HD is not shipped with a video monitor. Select a VESA-compliant CRT or LCD monitor with a minimum refresh rate of 75 Hz. Note that the MAXX-2400HD may not start correctly if an unsuitable monitor is connected. Connect the monitor to the VGA port on the rear of the unit. Refer to Figure 2 on Page 24

Connect the keyboard to the PS-2 keyboard port on the rear of the unit; connect the mouse to the mouse port. Refer to Figure 2 on page 24. **NOTE: If the mouse and keyboard connections are interchanged, the MAXX-2400HD may not boot up properly.** Be especially careful about this when using extender cables.

If you own more than one MAXX-2400HD, it may be appropriate to use a single keyboard, monitor, and mouse with a KVM switch to select between servers. Not all KVM switching systems are compatible. The KVM switch must supply an active signal to the server at all times, even when switched away from it. When first powering up the MAXX-2400HD, use only the supplied keyboard and mouse directly connected. Then test the KVM switch system that will be used thoroughly before installation is completed.

## Installing the Hard Drives

MAXX-2400HD uses twelve 1-TB drives in its 12 Terabyte RAID 6 array. These are packaged in a separate carton inside the main carton. The drives are fully configured and ready to run the MAXX-2400HD application. **It is important that the drives be installed in the correct positions in the RAID array.** Each drive has a number affixed to its packaging material. Install each drive in the corresponding numbered bay according to Figure 1.

Open the drive bay door by loosening the knurled screws and pulling lightly forward and down.

Install each hard drive in the corresponding numbered slot as follows:

1. Open the blue locking lever by pulling forward slightly
2. Insert the drive in the bay by sliding it in till you feel it “seat”
3. Close the locking lever.



Figure 1 - Drive Bay Organization

## Rear Panel Connections

Figure 2 indicates the Rear Panel connections on MAXX-2400HD. Each connection is described briefly in the following text. Make all connections appropriate to other equipment before applying power to the MAXX-2400HD.

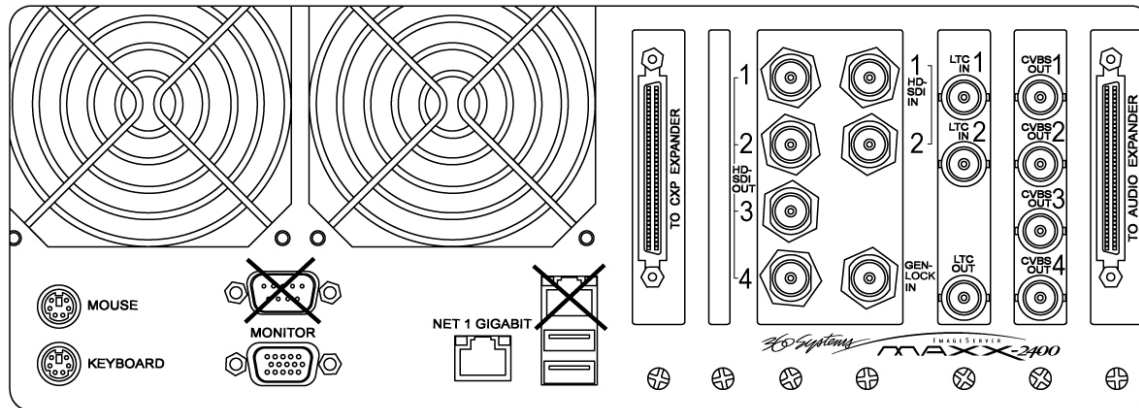


Figure 2 - Rear Panel Detail

### Rear Panel Connections to the MAXX-2400HD Server

- Mouse
- Keyboard
- USB (do not connect)
- CXP Interface Connector
- RS-232 Serial Port (do not connect)
- VGA Monitor
- NET 1 - Gigabit Ethernet
- NET 2 - not used
- Channel 1 and 2 HD-SDI Inputs (bi-directional)
- Channel 1, 2, 3, 4 HD-SDI outputs
- Channel 1, 2, 3, 4 - CVBS monitoring outputs
- Channel 1 LTC Input
- Channel 2 LTC Input
- LTC Output
- Genlock Input
- Audio Module Connector (AXP or DXP)



### HD-SDI Video Inputs

The MAXX-2400HD records Digital video on channels 1 and 2. It has separate BNC inputs for HD-SDI (serial digital per SMPTE 292M). HD-SDI inputs have a fixed 75-ohm termination.

### HD-SDI Video Outputs

Channels 1, 2, 3 and 4 have HD-SDI video outputs per SMPTE 292M.

### CVBS Monitor Outputs

Channels 1, 2, 3 and 4 have letterboxed composite video monitoring outputs.

### Genlock Sync Reference

The MAXX-2400HD is designed to be referenced to an external genlock source in the form of RS-170 black. The **GENLOCK** input provides a fixed 75-ohm termination. An internal crystal reference is also provided so that the server can be used as a stand-alone player.

### Gigabit Ethernet Port

A Gigabit Ethernet port is provided on the MAXX-2400HD. The **NET 1** port is intended for external transfer of program content between video servers. The **NET 1** port is also used for remote control using the optional Remote Workstation software. The **NET 2** port is reserved for future use and is not active. Use only the **NET 1** port.

### LTC Time Code Input

An LTC time code input is provided for Channel 1 and Channel 2. The LTC input provides a > 10k ohm termination. This input may be selected by means of the On-Screen user interface and recorded as a time code reference. This input may be selected by means of the On-Screen user interface and used as a start time reference. Note that time code is not actually recorded, the time code read at the start of recording is captured. When the clip is played back, the time code (in display, VITC and LTC outputs) starts from the captured time and proceeds continuously.

### LTC Time Code Output

An LTC time code output is provided on the **LTC OUT** BNC connector. It may be selected by means of the On-Screen user interface to output time code from any of the four video channels during playback. The LTC output has a source impedance of < 5 ohms.

### Keyboard

Attach the alphanumeric keyboard to the purple 5-pin **KEYBD** connector to control the server and manage clips with the On-Screen graphic user interface. **The server will only recognize the keyboard if it is attached before power up.**

### Mouse

A two-button scroll mouse is provided with the MAXX-2400HD. Plug the mouse into the green 5-pin **MOUSE** port. **Do not use the USB ports, even if the supplied mouse is USB capable.** Note that the server will only recognize the mouse if it is attached before power up.

### Monitor

A VESA-compliant computer monitor may be connected to the 15-pin VGA video port. The MAXX-2400HD resolution is fixed at 1024 x 768 pixels, with a refresh rate of 72 Hz. This is best-



viewed on 17-inch or larger monitors. 360 Systems does not provide monitors for the server. **Do not use older monitors that are not VESA compliant. The server will not start properly if an unsuitable monitor is connected.**

### **Serial Port**

The rear panel serial port is not used. Make no connection.

### **USB Ports**

The rear panel USB ports are not used. Make no connection.

### **Power Switch** (not shown in Figure 2)

Shutdown the system only by momentarily pressing the front panel power button, or through the SHUTDOWN command on the On-Screen user interface.

**PRESSING THE FRONT PANEL POWER BUTTON FOR FOUR SECONDS WILL FORCE A SHUTDOWN. USE THIS METHOD ONLY IF THE UNIT IS NOT RESPONDING.**

## Audio Module Connections

The AXP-3, AXP-4 and DXP-1 multi-channel audio modules provide for connection of audio equipment. Each is a 2-rack space module. Connection is made to the rear panel of MAXX-2400HD using a 68 pin cable. Figure 3 indicates the audio module's connectors and their functions.

### CAUTION!

Do not plug an audio module into the CXP connection. Damage to the system may occur. The audio connector on the MAXX-2400HD is clearly marked. Connect according to **Figure 3**. Be certain it is properly connected before applying power.

Connect Audio Module Here

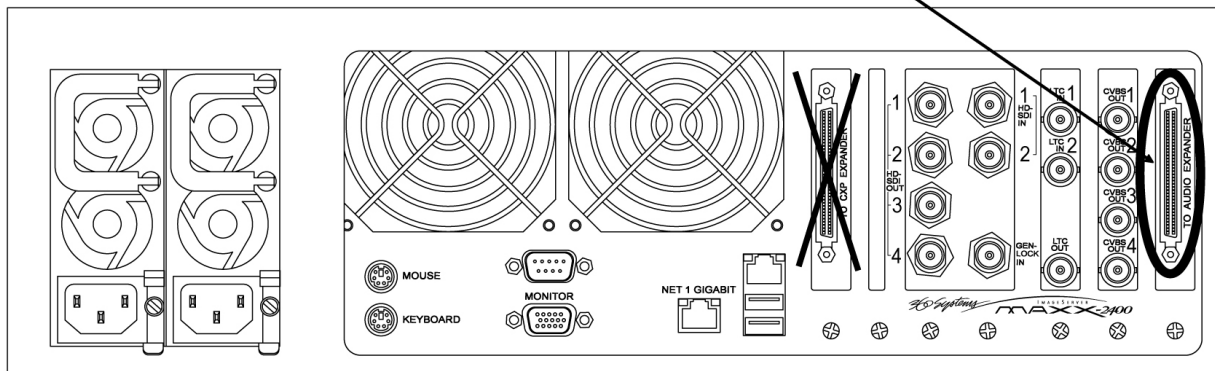


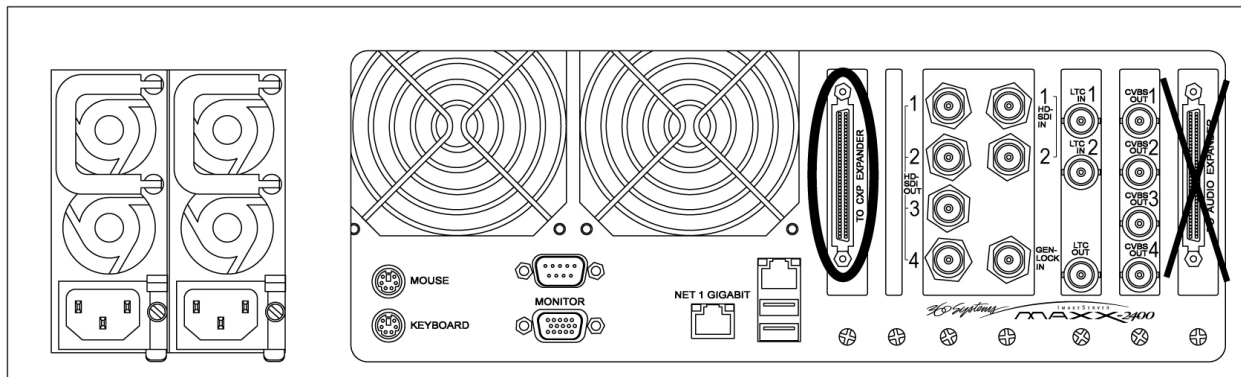
Figure 3 – Audio Module Connection to MAXX-2400HD

## Control Module (CXP) Connections

The CXP Module provides connections to the server's serial ports and its GPI interface using a 68 pin cable. Connect it between the back of the CXP module and the CXP port on the back of the server. Note that there are two cables supplied for initial connection.

### CAUTION!!

Do not plug the CXP Module into the AXP audio module connection on the server. Damage to the system may occur. The CXP connector on the MAXX-2400HD is clearly marked. Connect the CXP module per Figure 4. Be certain it is properly connected before applying power.

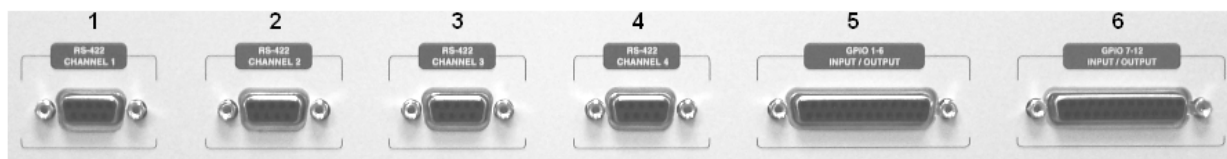


**Figure 4 - CXP Connection to MAXX-2400HD.**

### Serial Control Ports for Channels 1, 2, 3 & 4

Each of the four 9-pin “D” connectors on the CXP module provides independent control of the four video channels. They accept serial commands in VDCP, BVW or Odetics protocol. The multiple serial ports allow simultaneous connection of an automation controller and a desktop controller. See the chapter on Automation Control for further details.

Most broadcast automation systems and some remote control panels employ VDCP protocol. Many controllers used for transport, instant replay, and edit control employ BVW or Odetics protocol.



**Figure 5 - CXP Module Connectors**

### GPI Control

The MAXX-2400HD provides twelve GPI inputs for control of machine functions, which appear on two 25-pin **GPI** connectors. This “General Purpose Interface” can be connected to switch contacts or to an open-collector transistor output. GPI inputs are programmable, and can provide machine control such as PLAY, STOP, or RECORD through simple external switches.

The MAXX-2400HD also provides twelve GPI outputs which may be used to confirm that a command has been received, or for other purposes. The function of these open-collector outputs is programmable; they may be used to operate an LED, or they can drive a suitable logic input. The pin-out for the GPI connectors will be found in APPENDIX A.

# Basic Operations

This section introduces the Graphic User Interface (GUI), its menus and operating controls. If you want to skip ahead to learn how to record a clip, go to page 39. Skip to page 46 to read about playing a clip.

The graphic user interface is the primary way to manage server operations. With it, you can control recording and playout, set up video and audio formats, map remote control ports to video channels, perform editing and make playlists.

The GUI is operated with a keyboard, mouse, and monitor connected to the server rear panel. **During the first power on the system must be connected to a keyboard, monitor and mouse.** The server will ask you to accept the Software Licensing Agreement before it will operate. This screen will only appear during the initial startup.

## The Server Desktop

The server desktop is similar to many computer graphic interfaces. A task bar and start menu appear at the bottom of the screen. Use the Start menu button to launch applications, manage the system or to shut down the server.

### Launching the Graphic User Interface

The GUI launches automatically during start up. If it has been closed, click **Start**, then **Image Server GUI** to re-launch it. The GUI window can be moved or minimized as desired.

### Shutting Down the Server

Click **Start**, then **Shutdown**, then select either **Shutdown** to begin an orderly shutdown, or **Full Restart** to do an orderly shutdown and restart (without a full power down).

Alternatively, momentarily pressing the front panel power button will cause the system to begin an orderly shutdown. The server will acknowledge the button press with an audible beep and the front panel lights will begin to flash together. Any operation in progress will be halted, and any unsaved work will be lost.

In most cases the power will shut off automatically. However, if the front panel lights begin to blink, it means that the file system has been properly closed, and it is safe to force the power off by holding the front panel button in for 4 seconds.

If the system has stopped responding to commands and will not reset by pressing the front panel button, press and hold the button for four seconds to force a power down. Wait 5 seconds, and then the system may be restarted with another press of this button.

**DO NOT** disconnect AC power to shutdown the server. Doing so may cause loss of unsaved data, and may require the RAID drive array to re-synchronize – a process that could take several hours. Shutdown the system *only* by momentarily pressing the front panel power button, or through the GUI.

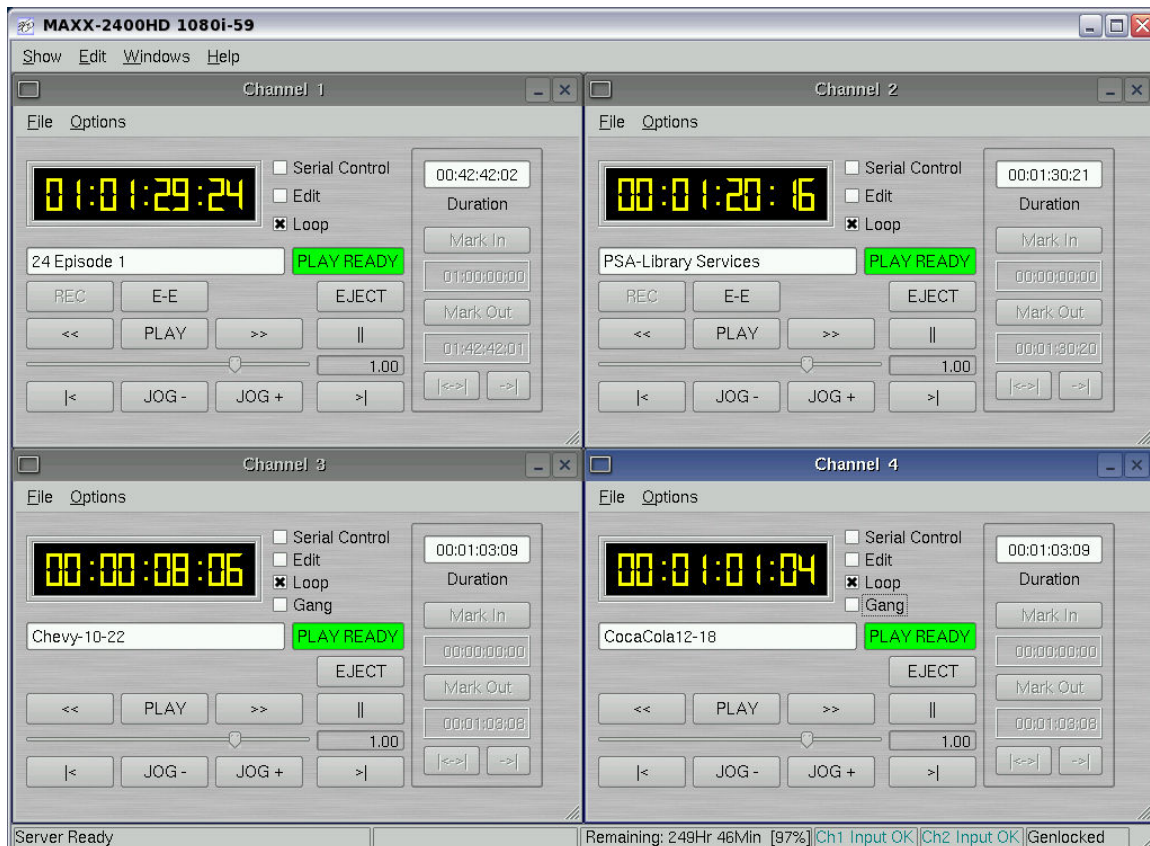
The **Quick Restart** option in the **Start>Shutdown** menu allows the GUI and video playback application to be restarted without restarting the entire operating system.

The **Restart FTP Only** option will restart the FTP service without affecting video operation.

## Graphic User Interface Overview

Once the server has successfully powered up, the VGA monitor will display the GUI of **Figure 6**. This view provides:

- A main System Menu bar for configuration operations
- A Status Bar that displays various system messages
- Four VTR-like transport controls, one for each video channel



**Figure 6: Graphic User Interface with Clip Transport Windows**

When using the mouse, all buttons of all channels will operate immediately, without first selecting a window to activate it. (Channel 3 is active in the illustration above, indicated by its blue title bar.)

When using key commands, the active window is the only transport that will respond. Use the **CTRL+TAB** key combination to change the active window in rotation, or use the mouse to activate the desired window by clicking anywhere in it.

Windows can be moved, resized and overlapped by dragging the title bar, window edges, or the resize tab at the lower right corner of a window. The **CTRL+TAB** key combination will also place the activated window in front of all other windows.



## System Menu Bar

The System Menu bar contains four menus: Show, Edit, Windows and Help.



## Show Menu

Contains selections for the four Channels and the clip management windows.

**Channel 1**  
**Channel 2**  
**Channel 3**  
**Channel 4**

Opens the specified window if it is closed, brings it to the top and activates it.

Key Commands – **F1**, **F2**, **F3**, **F4**

## Clip List

Opens the Clip Navigator window if it is closed, brings it to the top and activates it. See page 57.

Key Command – **Ctrl+L**.

## Find Clips

Opens the Clip Locator dialog. See page 57.

Key Command – **Ctrl+F**.

## Edit Menu

Contains a single selection, **Configuration**. This opens the main System Configuration dialog. See page 51.

## Windows Menu

Choices in this menu change the way the windows are displayed. Use the **CTRL+TAB** key combination to change the active window in rotation, or use the mouse to activate a specific window.

### Cascade

Arranges all open windows so that they are overlapping, but offset. It is useful as a starting point to rearrange the windows. This choice is especially useful with small monitors.

### Tile

Arranges all open windows so that each is fully visible. This choice is especially useful with larger monitors. In case Windows do not tile as expected, select Cascade to restore their original size and order, then select Tile.

In addition, there are selections for each open transport window. Selecting one of these brings that transport to the top of the display and makes it the active window.

## Help Menu

Contains a single item, **About**, which displays the server software versions, serial number and Unit ID.

## The Status Bar

A status bar appears at the bottom of the window that provides system information including GENLOCK, VIDEO INPUT DETECTED, and TIME REMAINING—PERCENT FULL. Messages such as CONNECTED TO HOST or CONNECTION TO HOST REFUSED are also displayed as diagnostics. Error and status messages from the RAID system can also be displayed here.

Channel 1 and 2 can Record or Play video content. Channels 3 and 4 only play content. All channels may be used at the same time.

Each channel can be controlled in two different views.

- The Transport View
- The Playlist View



## The Transport Channel View

The Transport Channel View is shown in Figure 7. This is the default view of each channel. Basic transport operations such as **play**, **stop**, **record**, and **head/tail trimming** appear in the Clip Transport window for each channel. These operate in familiar VTR fashion.

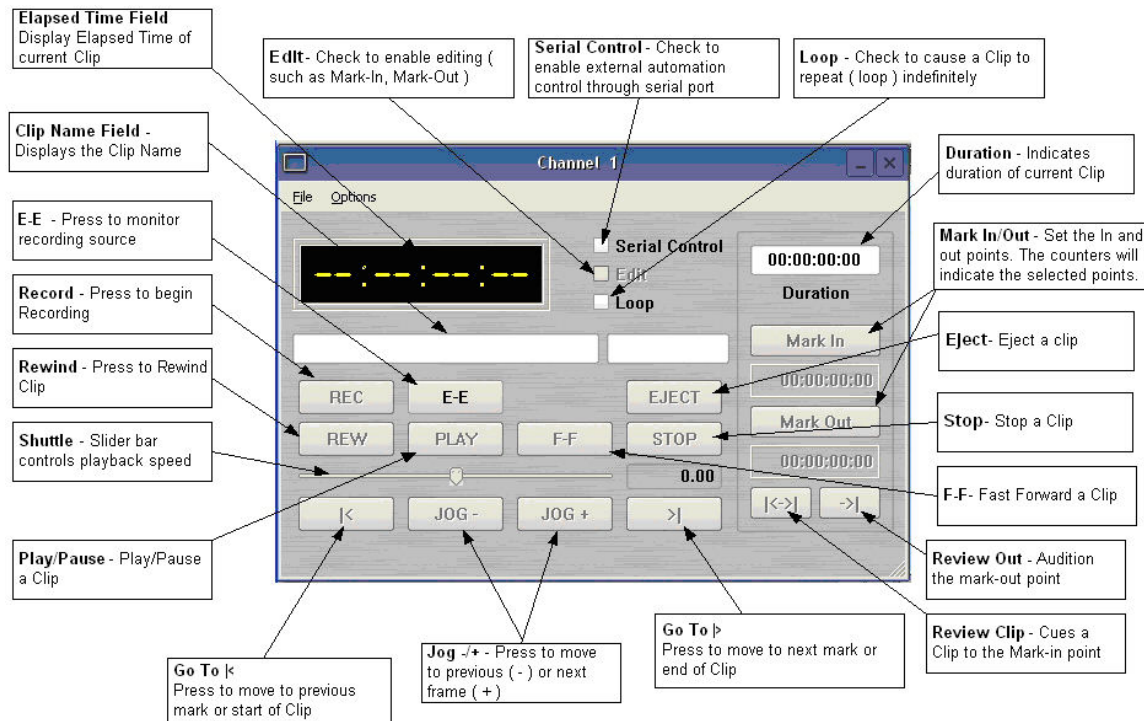


Figure 7 - Transport Channel View

## Transport Menu Bar

There are two menus, **File** and **Options**.

### File Menu

#### New

Channel 1 and 2 only. Opens the Clip Navigator to allow naming of a new clip, then prepares channel 1 or 2 for recording. See page 37.

Key Command – **Ctrl+N**.

#### Open

Opens the Clip Navigator to allow choosing a clip to load into the transport.

Key Command – **Ctrl+O**.

#### Save

Saves an edited clip using its existing file name.

Key Command – **Ctrl+S**.

### **Save As**

Opens the Clip Navigator to allow saving an edited version of the clip with a new name. This allows making alternate versions of a clip or making multiple segments of a master clip.

Key Command – **Ctrl+A**.

### **Playlist**

Switches from Transport View to Playlist View.

### **Close**

Closes the Transport window. This has the same effect as the Close box in the upper right corner of the window. Note that this will not stop playback or eject a loaded clip.

## **Options Menu**

This menu contains two selections.

### **Take Control**

Takes control of the video channel from another user (the Serial Control, a Remote Workstation, or if you are using a Remote Workstation possibly the local GUI.) This item is grayed out when the window has control.

Key Command – **Ctrl+T**.

### **Configure**

Opens the video channel's Configuration dialog. See pages 37.

Key Command – **Ctrl+C**.

## The Playlist Channel View

The Playlist Channel View is shown in Figure 8. This view allows multiple clips to be loaded in a playlist for sequential payout.

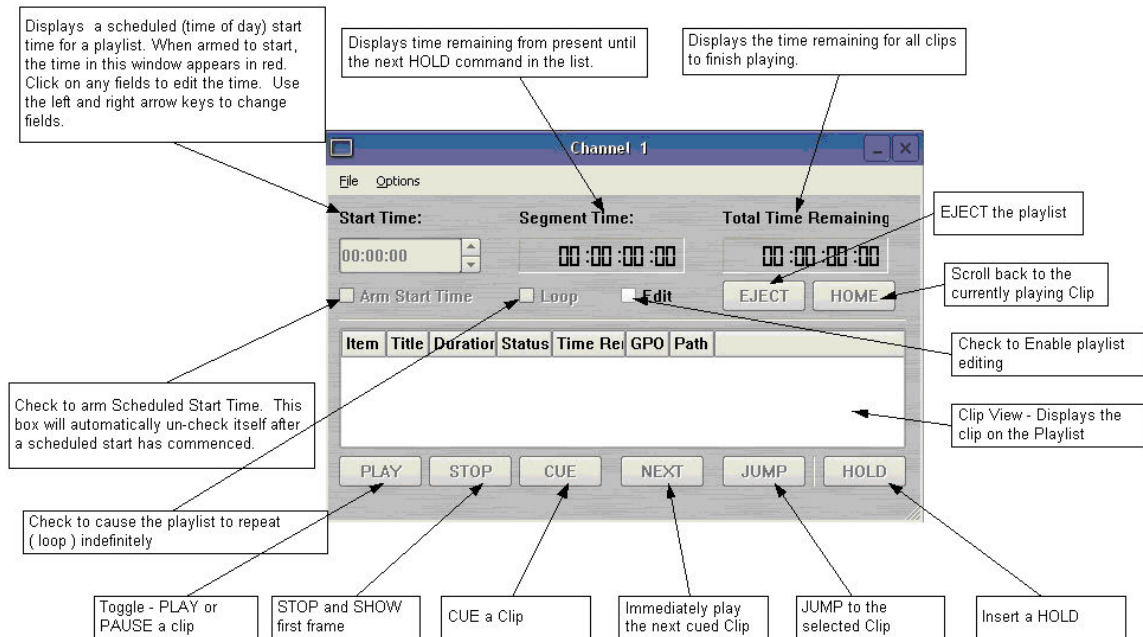


Figure 8 - Playlist Channel View

## Playlist Menu Bar

There are two menus, **File** and **Options**.

### File Menu

#### Open

Opens the Clip Navigator to allow choosing a clip to load into the transport.

Key Command – **Ctrl+D**.

#### Append

Opens the Playlist Selection dialog to allow choosing a Playlist to Append to the currently loaded list. This can be done while playing to allow continuous playback of new Playlists. See page 66.

#### Save

Saves an edited Playlist using its existing file name.

Key Command – **Ctrl+S**.

**Save As**

Opens the Clip Navigator to allow saving an edited version of the clip with a new name. This allows making alternate versions of a clip or making multiple segments of a master clip.

Key Command – **Ctrl+A**.

**Rename**

Opens the Playlist Selection dialog to allow renaming the currently loaded Playlist.

**Transport**

Switches from Playlist View to Transport View.

**Eject**

Ejects the currently loaded Playlist in preparation for creating a new one. (It is not necessary to Eject a list to load another saved list.)

Key Command – **Ctrl+N**.

**Close**

Closes the Playlist window. This has the same effect as the Close box in the upper right corner of the window. Note that this will not stop playback or eject a loaded list.

**Options Menu**

This menu contains two selections:

**Take Control**

Takes control of the video channel from another user (the Serial Control, a Remote Workstation, or if you are using a Remote Workstation possibly the local GUI.) This item is grayed out when the window has control.

Key Command – **Ctrl+T**.

**Configure**

Opens the Playlist's Configuration dialog. See page 65. Note that this is different than the dialog for the video channel setup, which must be accessed from the Transport View window.

Key Command – **Ctrl+C**.

## Initial System Configuration

### Selecting a Sync Reference

In many applications, this server and downstream equipment connected to it must be referenced to a common genlock source (SMPTE 170M or ITU-R-BT.470). A BNC connector is provided on the rear panel to receive a genlock signal. It has a 75-ohm termination.

An internal crystal reference is also provided so that the server can be used as a stand-alone player, and also for convenience for testing. Use particular care when operating the server with an internal reference, as synchronization with other equipment may not be possible. Systems that incorporate retiming circuitry in the router or video switcher may not require referencing.

Note that the input sync for recording is derived from the input itself. The E-E output is synchronized to the input as well, so it is not possible to time the E-E output to genlock.

### Setting the Video Sync Source

To use with a genlocked system, select **External Sync** using the GUI as follows:

- A. From the main menu bar select **EDIT->CONFIGURE**. Select the **TIMING** option. The screen of **Figure 9** appears.
- B. Select **EXTERNAL** as the sync source.
- C. Check that the front panel **GENLOCK** LED is now illuminated and the word **GENLOCKED** now appears in the bottom right of the main GUI window.

#### Genlock Signal Quality

A genlock signal for the server must conform to one of the standards listed in the Technical Specifications. An unstable genlock source may result in unwanted artifacts in the video output .

To use in a non-genlocked system, follow the instructions above but select **INTERNAL** Sync.

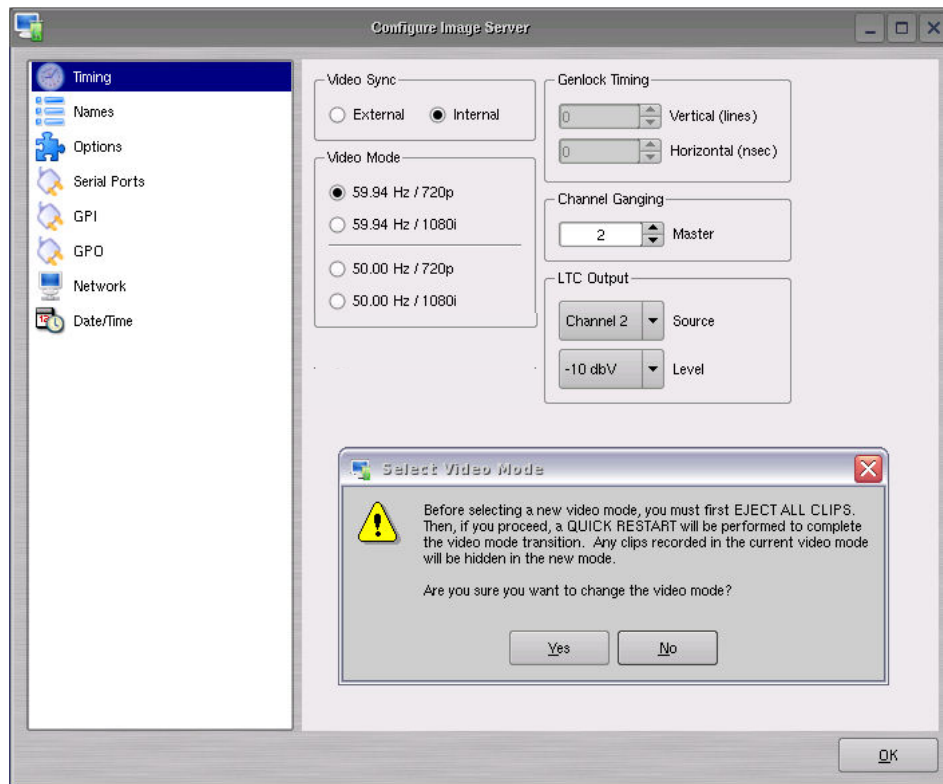
The input to the server uses the input signal itself as a reference, this allows recording any signal that conforms to the currently selected video format and frame rate. No configuration is required to use this feature.

## Selecting a Video Format

The MAXX-2400HD can record and play video in four high definition video formats:

1080i @ 59.94 Hz	1080i @ 50 Hz
720p @ 59.94 Hz	720p @ 50 Hz

To select a video format, go to Edit/Configure/Timing dialog on the GUI. Select a check-box for the rate at which you will record or play. A reminder will appear, to stop video on all channels and prepare for automatic restart in the new format. This takes at least 12 seconds, so the change should not be performed on-air.



**Figure 9 – Selecting Video Format**

The MAXX-2400HD must be set to operate in one format at a time; it does not play mixed video formats when the video format is changed, the only files visible on the GUI will be those recorded in the currently-selected video format. Files in another format will become visible when the server is placed in that operational mode. . For clarity, it is a good idea to store content in directories that are separated according to video format.

Audio is recorded and played at the industry standard of 48K, regardless of the video format selected.

## Making a Recording from the GUI

Video recordings are made using the Transport View of **Channel 1 or 2**. These channels can record or play clips, but not both at the same time. Channels 3 and 4 are playback only. The following steps are used to make a recording. Most configuration settings can be skipped once a workflow is established. Channel 1 is used below as an example; all instructions apply equally to channel 2.

### Record Configuration Options

If necessary, set Channel 1 and/or Channel 2 to the Transport View. Click **FILE->TRANSPORT** in the Playlist View to switch to the Transport View.

### Setting the Video Bit Rate

Select **OPTIONS->CONFIGURE** from the Channel 1 Transport Window. The Dialog box in Figure 10 appears.

- In the window, enter the desired Video Bit Rate (in Megabits/sec), not to exceed 125. Alternatively, use the up/down arrows to set a number.
- Click **APPLY** or **OK**.

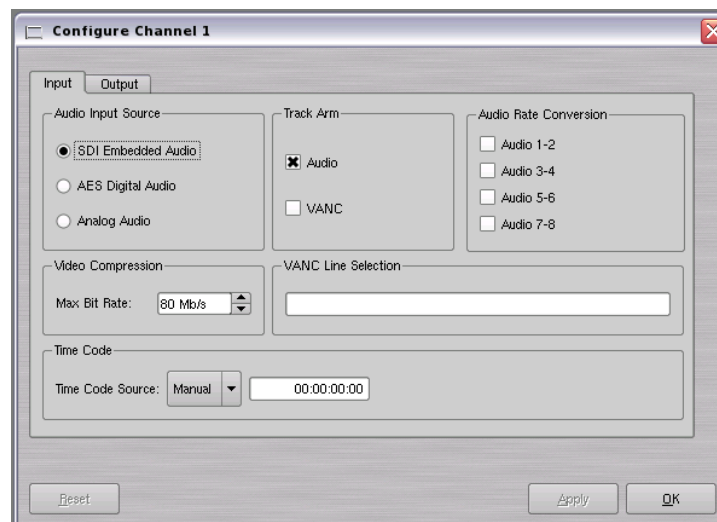


Figure 10 - Channel Configuration Dialog

## Setting the Audio Input Source

Select **OPTIONS->CONFIGURE** from the Channel 1 Transport Window. The Dialog box in Figure 10 appears.

- Select an Audio Input by clicking the desired button.
- Click **APPLY** or **OK**.

Embedded audio is eight tracks contained in the HD-SDI video stream.

AES/EBU Digital Audio refers to audio input from the optional DXP-1 multi-channel module.

Analog Audio refers to audio input from the optional AXP-3 and AXP-4 multi-channel module.

## Arming Audio Tracks

Select **OPTIONS->CONFIGURE** from the Channel 1 Transport Window.

Refer again to Figure 10 - Channel Configuration Dialog. Under TRACK ARM, Check AUDIO if recording audio is desired. All eight tracks are recorded.

Click **APPLY** or **OK**

## Setting an Audio Delay Time

Audio tracks can be offset from video in 1 millisecond increments up to +/- one second. The setting is per channel and non-volatile. It applies to playback only, not recording.

You must stop and start the playback to hear the result of a change. This adjustment is made in Transport mode; once set it also applies to Playlist mode on that channel.

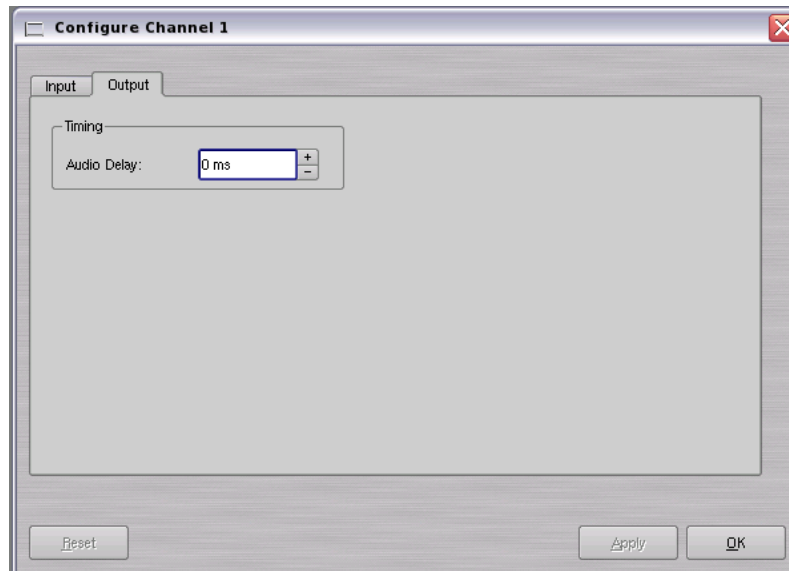
Select **OPTIONS->CONFIGURE** from the Channel Transport Window. The Dialog box in 10 appears.

Click the OUTPUT tab.

Enter a time offset value in the window.

Click **APPLY** or **OK**.





**Figure 11 - Audio Delay Time Offset**

## Audio Rate Conversion

- Converting the sample rate for audio applies only to AES/EBU digital audio. It is not relevant to analog audio, or Embedded audio. Select **OPTIONS->CONFIGURE** from the Channel 1 Transport Window. The dialog box in Figure 5 appears.
- Check a box under Audio Rate Conversion **only** if the corresponding AES/EBU audio source is not a video-referenced 48K sample rate (as with wild audio or 44.1K audio).
- Click **APPLY** or **OK**.

## Bit-for-Bit® Recording & Playback

Dolby®-E, Dolby Digital (AC-3) or other forms of compressed audio require that on playout, the data stream be identical to the original. **Do not use the audio sample rate converters** when working with these encoded audio formats. Further, the Dolby® encoder must be supplied with the same video reference as the HDSDI input to the server.

## Audio Output Sync Reference

The audio sample rate is derived from the selected video sync reference. Audio is recorded at a 48K sample rate, so the 0.1% pull-down for 59.94 Hz video is taken into account when generating the sample rate.

## Setting VANC Line Selections

Select **OPTIONS->CONFIGURE** from the Channel 1 Transport Window. The Dialog box in Figure 10 appears.

- Check the VANC box if Vertical interval ANCillary data (VANC) is to be recorded along with video.
- The VANC line selection data entry box will become active. Enter desired line numbers, separated by a comma. Ranges can be specified with a dash, such as “9-12”. Lines 9,10 11 and 12 will be included.
- In 720p, enter up to 12 lines. In 1080i, enter up to 6 lines. The six lines will be recorded in both field 1 and the corresponding lines in field 2.
- Click **APPLY** or **OK**.

## Selecting a Time Code Source

This high-definition server utilizes the time code standard specified in SMPTE 12M-1, and applies it as described in SMPTE 12M-2. It is suggested that the user refer to these documents, as HD time code differs significantly from standard definition methods.

- This function selects the source for time code for new recordings. The time code value obtained from the selected source will be applied from the beginning of a recording.
- Select **OPTIONS->CONFIGURE** from the Channel 1 Transport Window. The Dialog box in Figure 10 appears.
- The default Time Code Source is MANUAL. Alternatively, ATC-VITC time code may be selected.
- For MANUAL, enter a time value in the window for the first frame of the recording. Use the HH:MM:SS:FF format. It is not necessary to enter the colon ( : ) between digit pairs.
- Click **APPLY** or **OK**.

## Beginning Recording

When the setup steps outlined above are complete, you are ready to record. Place Channel 1 in the Record Ready mode as follows.

There are two approaches to starting a recording: “named recording” and “crash recording”. You can name the clip first, then press Record; or just start recording, and let the system generate a clip name automatically. The clip may be renamed as desired when the recording is complete. The advantage of the first approach is that when the recording is complete, it is fully identified and ready for use; the second approach is valuable for live action such as sports, where there is no time to lose and action must be captured at once.

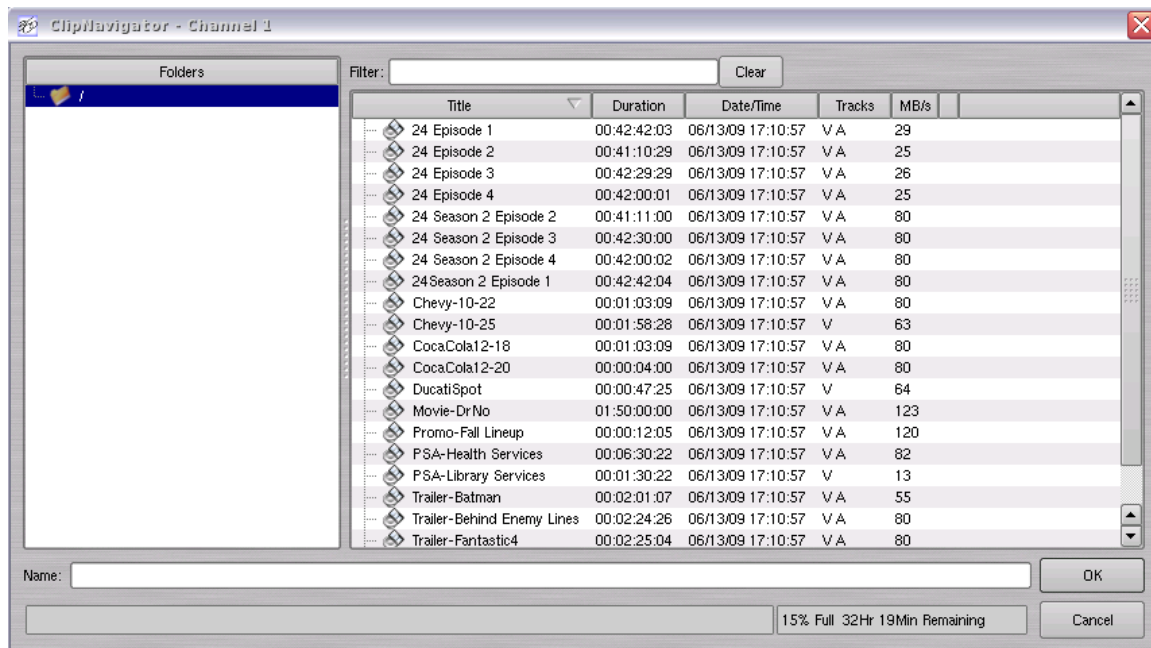
Clip names for crash recordings are of the form “new MMDD\_N”, where MMDD represents the month and day of the recording, and N is the lowest non-zero number that does not cause the name to conflict with any previously made recording.

## Making a Crash Recording

Press Record whenever Channel 1 reports that it is IDLE.

## Making a Named Recording

- A. From the Channel 1 Transport Window, Select **FILE > NEW**. The dialog of **Figure 12** appears.



**Figure 12 - Channel 1 Clip Navigator "New" mode**

- B. Enter a clip name using the keyboard. Up to 31 characters may be used. Spaces are allowed; however, some characters *other* than upper or lower case letters and numbers may not be used. These characters will not enter into the name field when typed. They include \* ( ) + = ; : ' " < > , . / and ? A list of existing clips will appear in the large window, and can be used as a name reference when creating new clip names.
- C. The Channel 1 transport Window will display the words **IDLE CUEING** for two seconds or less. When ready to record, the Channel 1 Transport Window will display **IDLE READY**.

Note: File naming is case sensitive. Upper case letters sort before lower case. The name *FILE* sorts in the order shown, based on differing capitalization: *FILE*, *File*, *fiLe*, and *file*. When using the server with automation systems or other remote controls, it is not a good practice to distinguish files only by differences in case.



Figure 13 - Channel 1 Ready to Record

- D. Click the RECORD button at any time to begin recording. The yellow time display counters will update the clip duration continually.
- E. To stop recording, click **STOP**.

**Note:** An in-progress recording must be 2 seconds long before it will appear in the clip list. Hitting the **STOP** button to end the recording after less than 2 seconds will also cause the clip to appear in the clip list.

## Monitoring a Recording Source with E-E Mode

The **E-E** button appears in the Channel 1 and Channel 2 Record/Play window. It allows the input signal to be monitored from the server output. E-E Mode toggles automatically as described below, but can also be switched manually at any time.

When a new clip is created for recording, the input source is automatically switched ON to the output—an E-E connection. When a clip is opened for play on Channel 1 or 2, E-E monitoring is switched OFF.

When Channel 1 or 2 is switched to playlist mode, the E-E monitor is switched OFF. E-E mode cannot be toggled while the channel is in playlist mode.

When E-E is ON, the input video signal is routed to the outputs. Manually toggle the E-E mode button OFF to switch the output to the servers output, for conventional playback operation.

Under automation control, Auto E-E behavior is slightly different than under GUI control. The server will remain in E-E ON mode until a transport control command (Play, Stop, Jog, etc) is received. After receiving such a command, the server will remain in E-E OFF mode until record mode is entered. In record mode, E-E mode is ON. As with GUI operation, automation controllers may send E-E ON and E-E OFF commands to override the automatic operation.

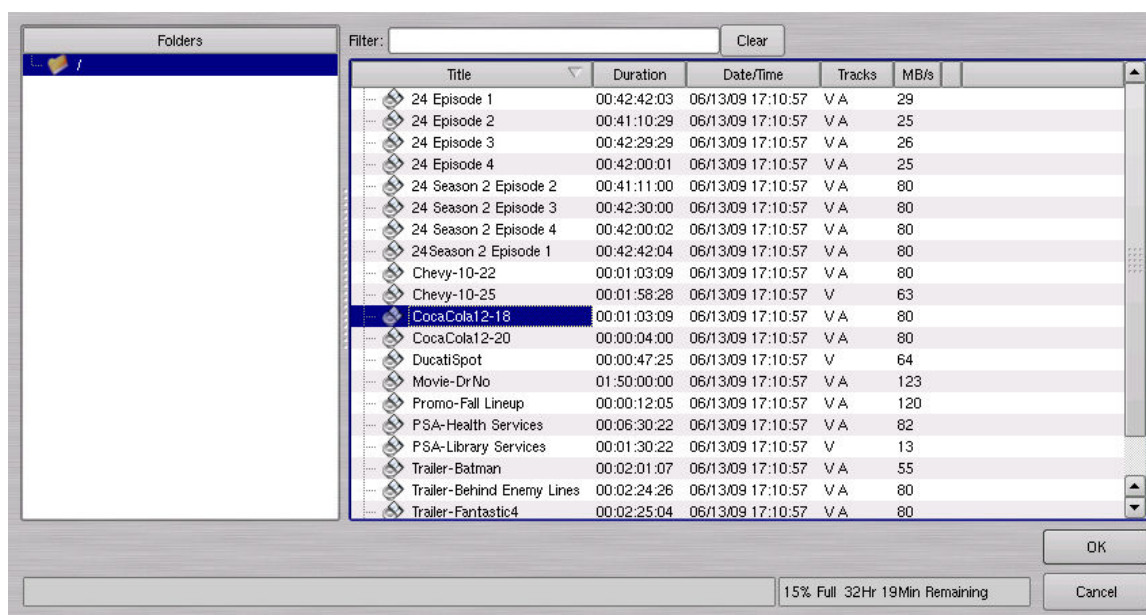
Note that when in E-E mode the video outputs are not timed to the genlock signal. This will not be noticeable when connected directly to a monitor. However, there may be timing offsets when feeding timed routers or switchers. The symptoms of this will vary depending on the particular equipment, including horizontal picture shift or timing error indications. If the input is not synchronous with genlock, it may roll vertically. E-E mode is not intended to be used on-air, only as a production tool.

## Playing a Clip from the GUI

Video Playback can be done on all four channels, individually or simultaneously. The record-capable channels (1 and 2) can record *or* play, but not both at once. Follow these steps to play a clip:

### Beginning Playback

1. Select **FILE > OPEN** from the Transport Window of Channel 1, 2, 3 or 4. The Clip Navigator shown in **Figure 14** appears.
2. Navigate the folder structure if necessary by clicking on the folders.
3. Select the clip to be play by double-clicking it.
4. When the Transport Window indicates **Idle Ready**, the clip can be played by clicking **PLAY**.



**Figure 14 – Channel-1 Clip Navigator in “Open” Mode**

### Looping a Clip

Clicking on the **LOOP** checkbox in the Transport View will cause a clip to loop until **LOOP** is unchecked, or until **STOP** is clicked. **LOOP** may be checked or unchecked before or during playback, but must be changed at least 2 seconds before the end of clip to take immediate effect.

### Pausing a Clip

Click **PAUSE** at any time to pause a clip. Click again to resume. The **PAUSE** button is the same key as the **PLAY** button.

## Ejecting a Clip

Ejecting a clip effectively removes it from the transport. The channel will output Black. Press **EJECT** to eject a clip.

## Using Jog

The **JOG +** command will move to the next frame and go to Still. The **JOG-** command will move to the previous frame and go to Still.

## Using GO-TO

Click the arrows [**<** or **>**] to go to the next trim point (Mark In or Mark Out) in the selected direction. When in Edit mode, an additional click in the selected direction will go to the actual beginning or end of the entire clip.

## Using Fast Forward / Rewind

**F-F** (Fast Forward) and **REW** (Rewind) buttons transport program material at high speed in the chosen direction. Four speed choices are available in each direction. Click the button repeatedly for: 4x, 16x, 64x, and 128x. Audio does not play at any speed beyond +/- 2X.

## Slow Motion Playback

The MAXX-2400HD will play smooth slow-motion video in forward or reverse, at any speed from zero to 2X. Direction can be instantly changed, using either the GUI or a desk-top controller. Audio is also played at these lower speeds. At speeds beyond 2X, video frames will be selected as needed, yielding a chunky result; audio is muted at high speeds. Most slo-mo playback for sports and other uses lies well within the 2X zone.

To play in slow motion from the GUI, press **PLAY** and then move the shuttle slider to the desired speed—within a range of 2X range forward or reverse. See the following section for details on the Shuttle control. For faster playback from the GUI, use the **FAST FORWARD** or **REWIND** buttons as described in the preceding section.

In sports, slow-motion control is usually accomplished with a desk-top slow-mo controller, such as those made by DNF Controls and others. These provide a hands-on experience far preferable to using the GUI.

## Using Shuttle to Control Playback Speed

The **Shuttle Control** is a slider bar that controls playback speed. Playback speed control employs *varispeed* algorithms that may skip frames. It is not a perfect fast motion mechanism.

The **center position** represents zero speed, or Still.

The **right** and **left** extents of the slider represent  $\pm 2x$  maximums.

The Shuttle control slider works in three basic ways: Snap-Back to still, Hold Speed, and Mouse Wheel.

- In **Snap-Back** operation, click and drag the slide control to change speed. Releasing the slider bar will let it snap back to zero speed, or still.

- For **Hold Speed** operation, position the cursor over the slider control scale (not the slider arrow) and click the left mouse button to increment the speed control. The transport will run in the selected direction at the selected speed without holding the mouse button down. The cursor may now be moved over the Stop button to wait for the desired point.
- When using a **wheel mouse**, position the cursor over the slider scale and rotate the wheel to increment speed. Rolling the wheel in opposite directions changes the direction the arrow slider moves. To stop video, click the Stop button or the arrow slider.



## Editing a Clip

Edit controls are activated with the **Edit** check box. Several buttons are available to define the beginning and end of a region within a clip; associated time code displays are also present.

These non-destructive Mark In and Mark Out trim points can be set to define a portion of a clip to be played. These “edit pointers” do not create a new clip from the original material; they act like virtual trims, and material outside of the trim points is excluded, but can be retrieved by resetting the Mark pointers. After setting the Mark In and Mark Out points, clips will play between these points. These edit values are saved with the clip.

Edits may be saved to the current clip by de-selecting the **Edit** check box, or choosing **Save** from the clip window **File** menu. **Save As** works to save the edit points to a new clip name, even if the edits have not been saved in the current clip. This is a great help while conducting an Edit-while-Recording.

## Using Edit While Recording

Clips are most often edited after recording is complete, but it is sometimes desirable to create sub-clips while the recording is still in progress. This is the preferred way to extract sports highlights, for example.

Clips become available for editing about two seconds after the recording begins. Open the recording on either Channel 2 or 3 by selecting the clip name from the **FILE > OPEN** menu. (A recording must be 3 seconds long before it will appear in the clip list.)

Use the transport controls to select and mark the In- and Out-Points, as desired.

*Without* un-checking **Edit**, select **FILE > SAVE AS**, enter a new clip name, and click **Enter**. A new clip is created that will play only between the In-Point and Out-Point. This clip can now be played on the third or fourth channel, or assembled into a playlist.

Next, use the transport controls to locate another set of In- and Out-Points for a second segment, and repeat the **Save As** command.

As noted above, it is usually easier to leave the edit channel in Edit mode when you plan to make multiple “Saved As” clips. If you de-select **Edit** with unsaved changes, you will be given a choice to save or discard the edit points. **Remember that you will be saving the edits to the file that is currently being recorded. Re-editing is required to see parts of it outside the region defined by Mark In and Mark Out, even if the recording continues after the editing session.**

### Marking the IN point

Sets the current time code value into the Mark In point time display. The **Mark In** button can capture a time code value from the clip when it is still, or on-the-fly.

### Mark In Display

Displays the time code of the Mark In point. When no Mark In point has been set manually, this displays the Start of Message (SOM) time code (usually 00:00:00:00).

The values in this display window may be set by two methods:

- Enter Mark In point from the keyboard: Use the mouse or Tab key to move between In and Out fields. When a field is highlighted, enter a numeric value from the keyboard.
- Whether a clip is still or playing, press Mark In to capture a time code value from the clip's current position.

### Marking the Out Point

Sets the current time code value into the Mark Out point time display. The **Mark Out** button can capture a time code value from the clip when it is still, or on-the-fly.

### Mark Out Display

Displays the Mark Out point time code. When no Mark Out point has been set manually, this displays the EOM time code (originally the end time of the recording).

The values in this display window may be set by two methods:

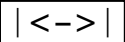
- Enter Mark Out point from the keyboard: Use the mouse or Tab key to move between In and Out fields. When a field is highlighted, enter a numeric value from the keyboard.
- Whether a clip is still or playing, press Mark Out to capture a time code value from the clip's current position.

### Duration Display

Displays the total running time (TRT) of the current clip. TRT is defined as the difference in the time codes between the first and last frames, plus one. For example, if the first frame of the clip is 00:00:00:00 and last frame displayed at the end is 00:00:01:15, the reported duration will be 00:00:01:16.

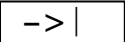
With 59.94 Hz drop-frame time code, the true play duration may not be the exact numerical value of  $((\text{Mark Out} - \text{Mark In}) + 1)$  due to the discontinuities in the drop-frame time line. The true run time is shown in the Clip Navigator.

### Auditioning the Mark In Point (Review Clip Button)

The Review Clip button  cues the clip to the Mark In point (or SOM, if no Mark In point exists) and begins playback. Review Clip will stop at the Mark Out point. The Mark Out point will be displayed in Still mode.

The Review Clip button may be used to check the Mark In point without playing all the way through the clip. After Review Clip is pressed and play begins, all of the standard transport buttons are available for use.

### Auditioning the Mark Out Point (Review Out Button)

The Review Out button  may be used to audition the Mark Out point without playing all the way through the clip. It will cue the clip to three seconds before the Mark Out point (or EOM, if no Mark Out Point exists) and then begin playback. Review Out will stop at the Mark Out Point.

## System Configuration

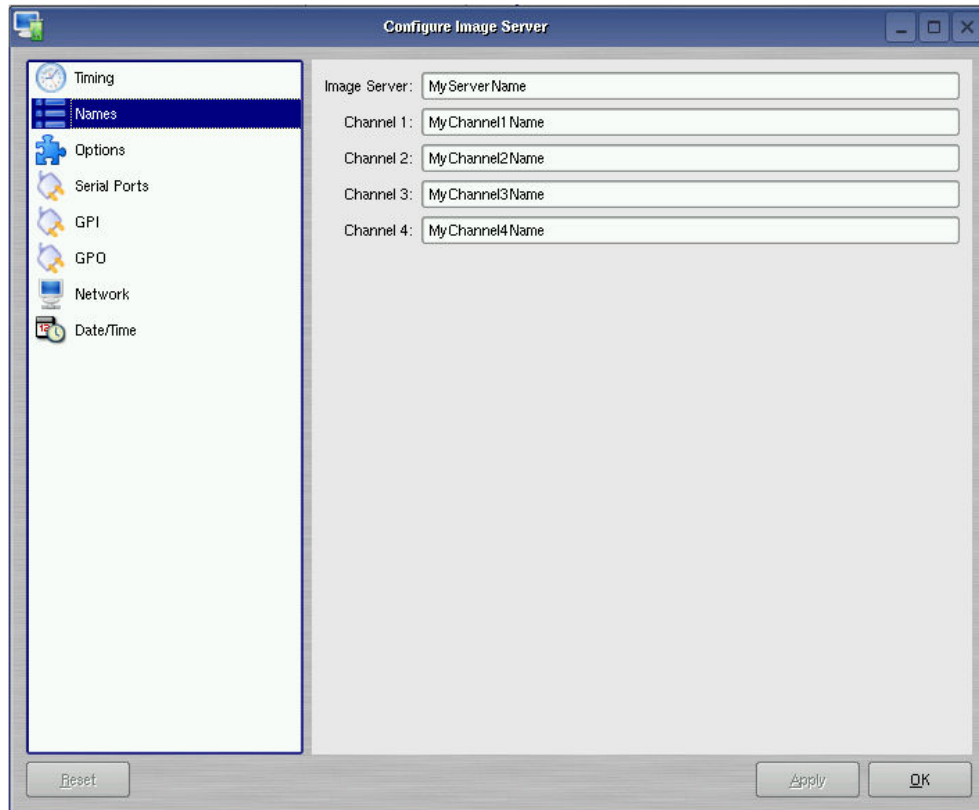
The following configuration options apply to the server as a whole, except where it applies specifically to an individual channel.

### Assigning Names to the Server and Transport Channels

The server can be assigned a name that will be displayed along the top of the Main GUI Window. Each individual server channel can also be given a name.

To assign a name to the server or transport channels, click **EDIT > CONFIGURE > NAMES** from the main menu pulldown.

The screen of Figure 15 is displayed. Use the keyboard to type in a name for any of the selections. Names can be up to 31 characters in length. Spaces, digits and other non-alphanumeric characters may be used. Click **APPLY** to accept the name. The names will appear in their appropriate windows immediately.



**Figure 15 - Configure Names Screen**

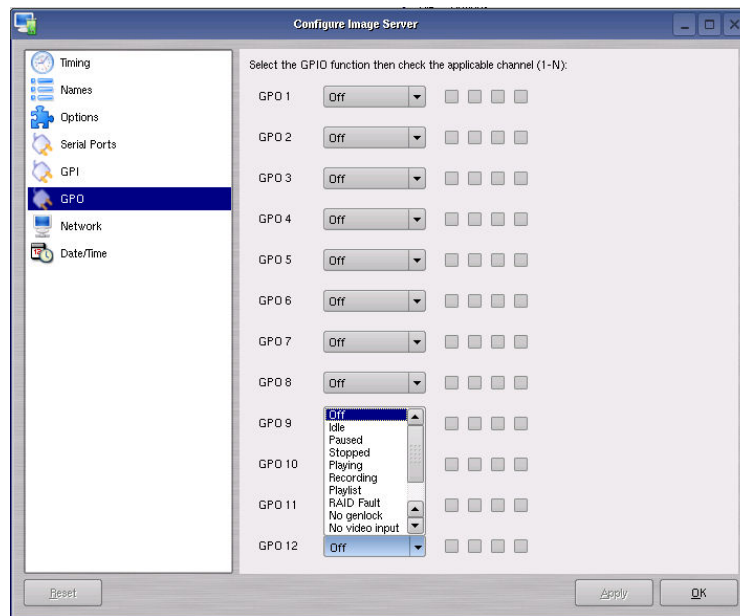
## Programming GPIO Outputs

The MAXX-2400HD has twelve General Purpose Outputs, referred to as GPO 1 through 12. Each can be programmed to go active on the selected channel when one of the following events occurs:

<b>IDLE</b>	Transport returns to idle
<b>PAUSED</b>	Transport is paused
<b>STOPPED</b>	Transport is stopped
<b>PLAYING</b>	Transport is playing
<b>RECORDING</b>	Transport is recording
<b>RAID System Fault</b>	RAID or System Fault
<b>NO GENLOCK</b>	No genlock
<b>NO VIDEO INPUT</b>	No video at the selected input
<b>PLAYLIST</b>	Control GPO via playlist

To program a GPO output, select **EDIT->CONFIGURE->GPO**. The screen of Figure 16 is displayed. GPO 1 through 12 are triggerable outputs. The checkboxes to the right of each selection represent channel 1, 2, 3 and 4. GPO 9 is shown with the trigger option pulldown expanded.

1. To activate one of the GPO, pulldown the event menu and select which event will activate the GPO.
2. Select an associated channel where applicable by checking the channel checkbox.
3. Click **APPLY** to activate.



**Figure 16 - GPO Configuration Screen**

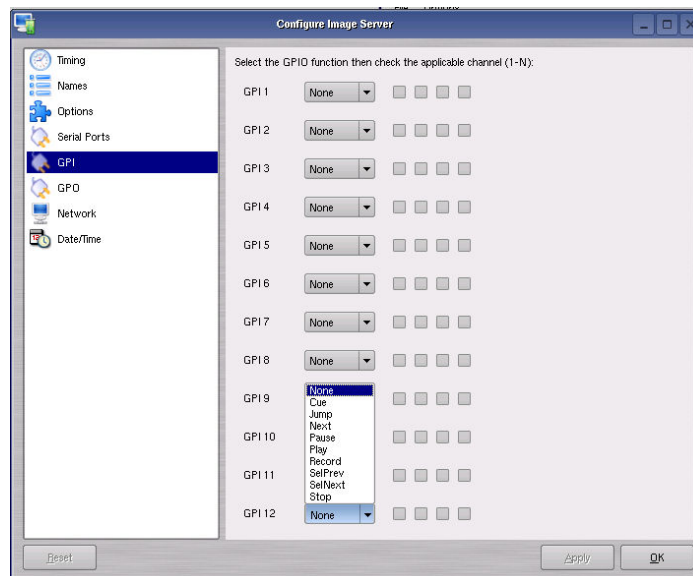
## Programming GPI Inputs

The MAXX-2400HD has 12 General Purpose Inputs, referred to as GPI 1 through GPI 12. Each can be programmed to trigger one of the following events on a channel:

<b>CUE</b>	Cue a clip
<b>JUMP</b>	Cue selected clip for immediate playback (Playlist Mode only)
<b>NEXT</b>	Immediately plays next cued clip in a playlist for playback (Playlist Mode only)
<b>PAUSE</b>	Pause a clip
<b>PLAY</b>	Play a clip
<b>RECORD</b>	Start a recording
<b>SELPREV</b>	In Playlist Mode – Navigate to clip above currently selected clip
<b>SELNEXT</b>	In Playlist Mode – Navigate to clip below currently selected clip
<b>STOP</b>	Stop a clip

To program a GPI Input, select **EDIT->CONFIGURE->GPI**. Figure 17 will display the screen. GPI 1 through 12 are programmable inputs. The checkboxes to the right of each selection option represent video channels 1, 2, 3 and 4. GPI 9 is shown with an expanded pulldown for trigger option.

1. To activate a GPI input, select the event from the pulldown the event menu
2. Mark a checkbox for the channel of interest. The event will be triggered when that GPI goes active.
3. Click **APPLY** to activate.



**Figure 17 - GPI Configuration Screen**

## Configuring the Ethernet Network

MAXX-2400HD provides a number of user settings that configure it for use in a practical network. These will be found on the Configure Network tab shown below.

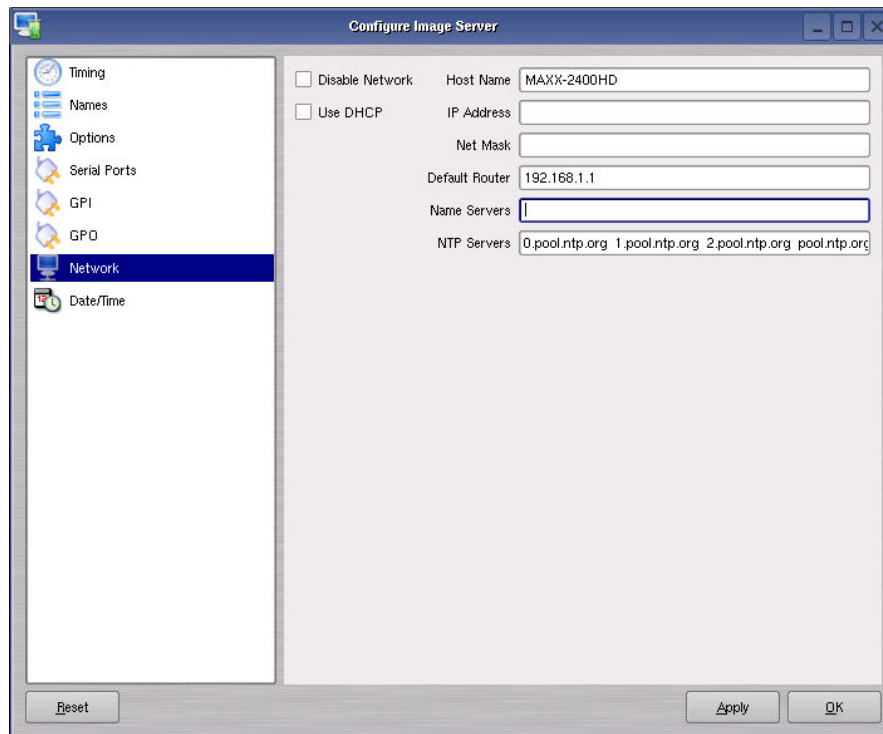
The **NET-1** Ethernet port on the server has a unique IP Address. In this way, each server can be identified on the network.

### Network Settings Tab

Use the Main Menu selection bar at the top of the server GUI to configure network communication settings.

Click **EDIT > CONFIGURE-> NETWORK**

The screen of **Figure 18** is displayed.



**Figure 18 - Network Configuration Screen**

The server is shipped with a default network Host Name and IP Address. Qualified network engineers may change these configurations to suit your specific network environment. Factory defaults for networking are:

- Network Disabled
- Use DHCP

### Disabling the Network [X]

This selection turns the network OFF or ON. The default is Disabled (the box is checked). To Enable the network connection, click the box to un-check it. Disabling the network can be used to deny access to the server from the network for security purposes.

### Enabling/Disabling DHCP [X]

Enabling DHCP will configure the network interface automatically.

If the DHCP box is not selected, the user may then manually enter assignments in the following windows:

- IP Address ( Example: 192.168.1.20 )
- Net Mask ( Example: 255.255.255.0 )
- Default Router ( Example: 192.168.1.1 )

The Host Name and NTP domain name may be a fully qualified domain name, such as edit1.mydomain.com. All other manually configured addresses must be properly formatted IP addresses.

### Saving Network Configuration

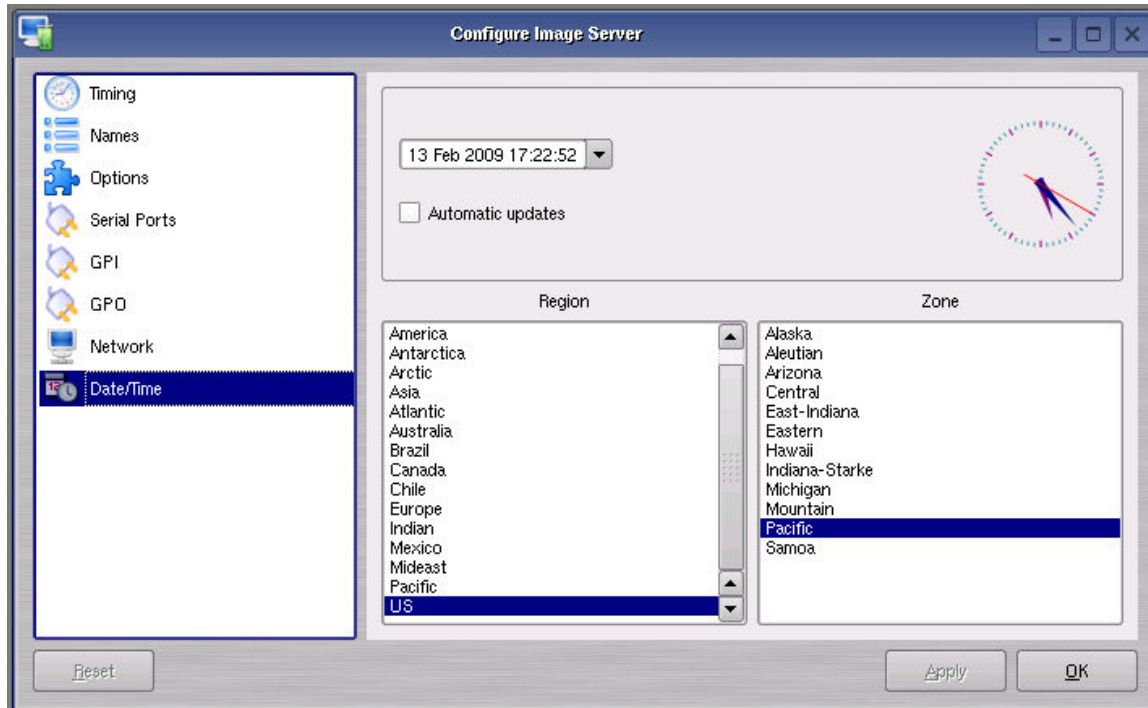
Click on **OK**, **APPLY**, or **CANCEL** to accept or abandon new entries.

The IP address of the system is displayed in the upper-left corner of the GUI at the end of the main window title.

**The server is designed to be used in a private dedicated video network. A firewall must be used in systems that require internal security or connection to public networks. Consult with a network security specialist for guidance on the best hardware, programming and practices for your facility's requirements.**

## Setting the Date and Time

Click **EDIT->CONFIGURE->DATE/TIME**. The dialog below appears.



**Figure 19 - Time/Date Configuration Screen**

Select the **REGION** and **ZONE** according to your geographic location or time zone. Use the scrollbar as necessary, and then click on the desired value.

Set the **TIME** and **DATE** by clicking on the Time/Date field and navigating the clock and calendar.

Check **Automatic Updates** to enable automatic updates using the Network Time Protocol (NTP). Refer to Network Time Protocol on page 78.

**Note:** A System Restart is required for a Time Zone change to take effect.



## Clip Navigator

The MAXX-2400HD's Clip Navigator is used to find, select, delete, name, and rename clips.

- Clips can be dragged and dropped anywhere on a Transport for immediate playback.
- Single or multiple clips can be dragged into a Playlist. See page 62.

Click **SHOW->CLIPLIST** from the main pulldown menu to display the Clip Navigator.

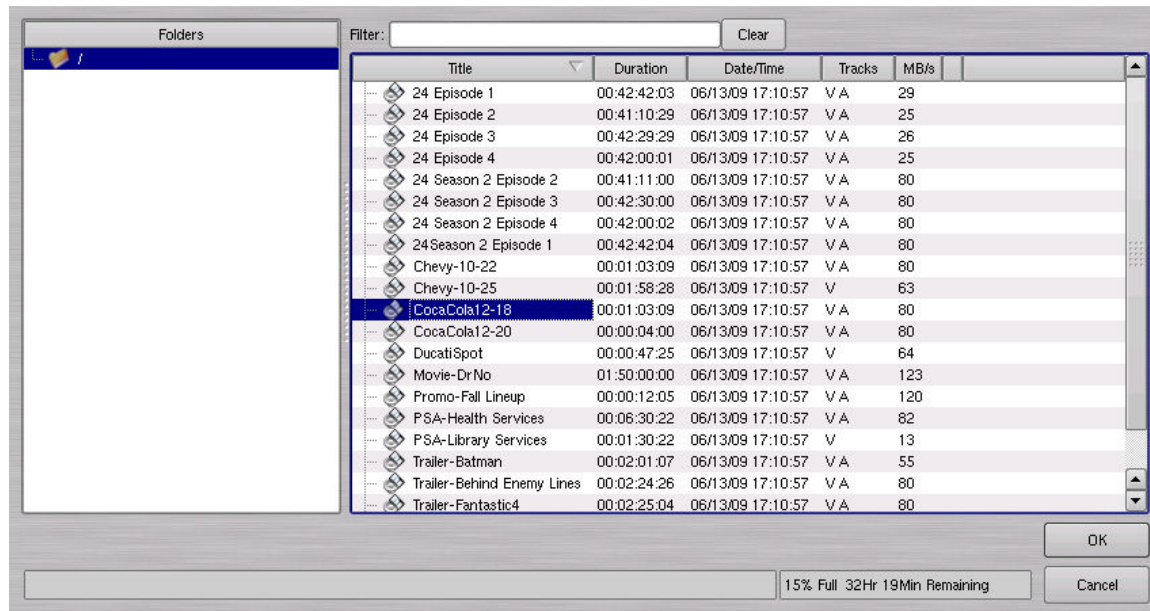


Figure 20 – Clip Navigator

## Renaming and Deleting Clips

Clips can be renamed by right clicking on them with the mouse, then selecting Rename from the pop-up menu.

Clips can be deleted by right clicking on them with the mouse, then selecting Delete from the pop-up menu.

## Sorting Clips

Clips can be sorted in forward or reverse order by any of the columns by clicking once or twice on the column heading. The previous sort is maintained, so if the sort is by Name, then by Profile, the clips of each Profile will be sorted by Name.

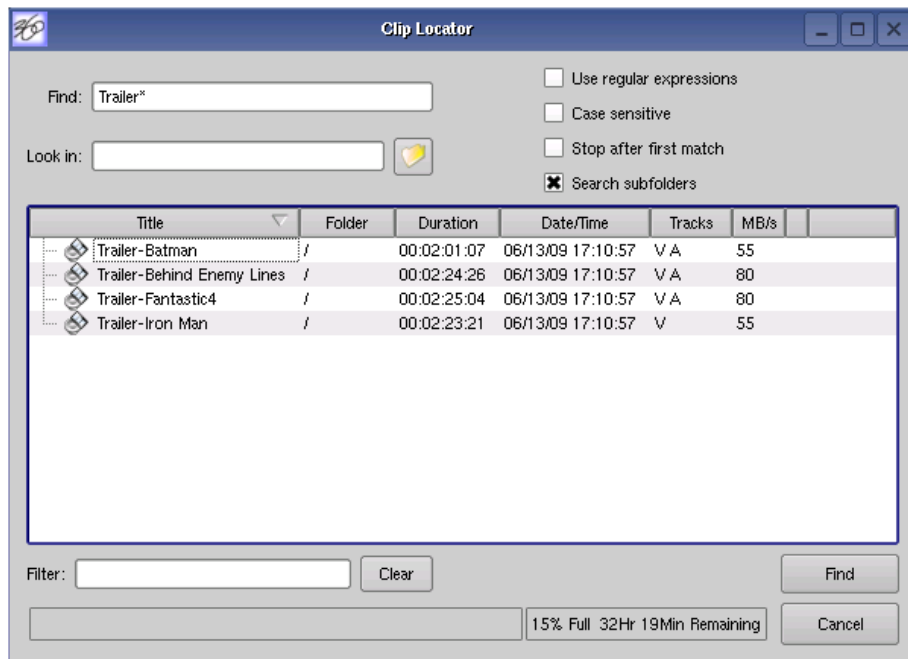
## Filtering the Clip Display

You can limit the number of clips displayed by typing a string in the **FILTER** window. For example, typing "AT" in the filter window would limit the display to all clips that contain "AT" somewhere in the clip name. Pressing the **Clear** button restores the complete display.

## Finding Clips

Clips can be easily found using the Clip Locator. To locate a clip:

1. Click **SHOW > FIND CLIPS**. The Clip Locator screen of **Figure 21** appears.
2. Check **Case Sensitive** to make the search case-sensitive.
3. Check **Stop After First Match** to find only the first match.
4. Check **Use Regular Expressions** to search for the string of interest **ANYWHERE** in the clip name. With **Regular Expressions unchecked**, the search will match only clips that **BEGIN** with the string entered at **FIND**. See the next page for more on Regular Expressions.
5. Optionally, Enter a string in the **FILTER** field to limit the number of clips displayed. For example, entering "AT" in the FILTER field will limit the display to only clips containing "AT" in their clip name. Pressing the **Clear** button restores the complete display.
6. Enter a name or part of a name in the **FIND** field. Press **ENTER** to initiate the search. The clip(s) will be displayed according to the rules set by the checkbox settings.



**Figure 21 - Clip Locator**

## Finding Clips Using Wildcards

The following wildcard conventions may be used in a search when Use Regular Expressions is *unchecked*.

- \* Match anything. For example, to find all clips starting with "xyz", use the pattern "xyz\*". To find all clips containing "2008" use "\*2008\*".
- ? Match any single character.

## Finding Clips Using Regular Expressions

A regular expression ("RE") specifies a pattern to be matched in a clip name. Regular expressions can contain both special and ordinary characters. Ordinary characters just match themselves. Thus, the RE "night" would match the "night" in the clip name "Tonight Show", so this and any other clip name with "night" in it would be placed in the list of found clips.

The following special characters are supported:

- . (dot) This matches any single character. "a.c" matches "abc", "aac", "a2c" and "a c" but not "acd".
- ^ (caret) This matches the start of a clip name. To find all clips starting with "xyz", for example, use the Regular Expression "^xyz".
- \$ Match the end of the clip name. To find all clips ending in "xyz" use the RE "xyz\$".
- < Match the beginning of a word. For example "<Show" will match all clip names containing a word that starts with "Show", such as "Now Showing", but not "LateShow".
- > Match the end of a word.
- \* Match zero or more repetitions of the preceding character. ".\*" will match anything – "G.\*N.\*" will match "Georgia Evening News" or "Good Night".
- + Match 1 or more repetitions of the preceding RE.
- ? The preceding Regular Expression term is optional. "ab?c" will match "ac" or "abc" but not "adc".
- [ ] Used to indicate a set of characters. Characters can be listed individually, or a range of characters can be indicated by giving two characters and separating them by a "-". Special characters are not active inside sets. For example, [a + \$] will match any of the characters "a", "+", or "\$"; [a-z] will match any lowercase letter, and [a-zA-Z0-9] matches any letter or digit. If you want to include a "-" inside a set, precede it with a backslash, or place it as the first character. You can match all characters that are *not* within the set by making "^" as the first character of the set; "^" elsewhere will simply match the "^" character. For example, [^7] will match any character except "7".
- SPACE A space is treated as an ordinary character. " Show " (<space>Show) will match "Tonight Show" but not "Now Showing" or "NewShow". " " will match any clip with a space in the name.

The subject of Regular Expressions is much larger than can be covered here. Further information will be found on the internet.

## Using Playlists

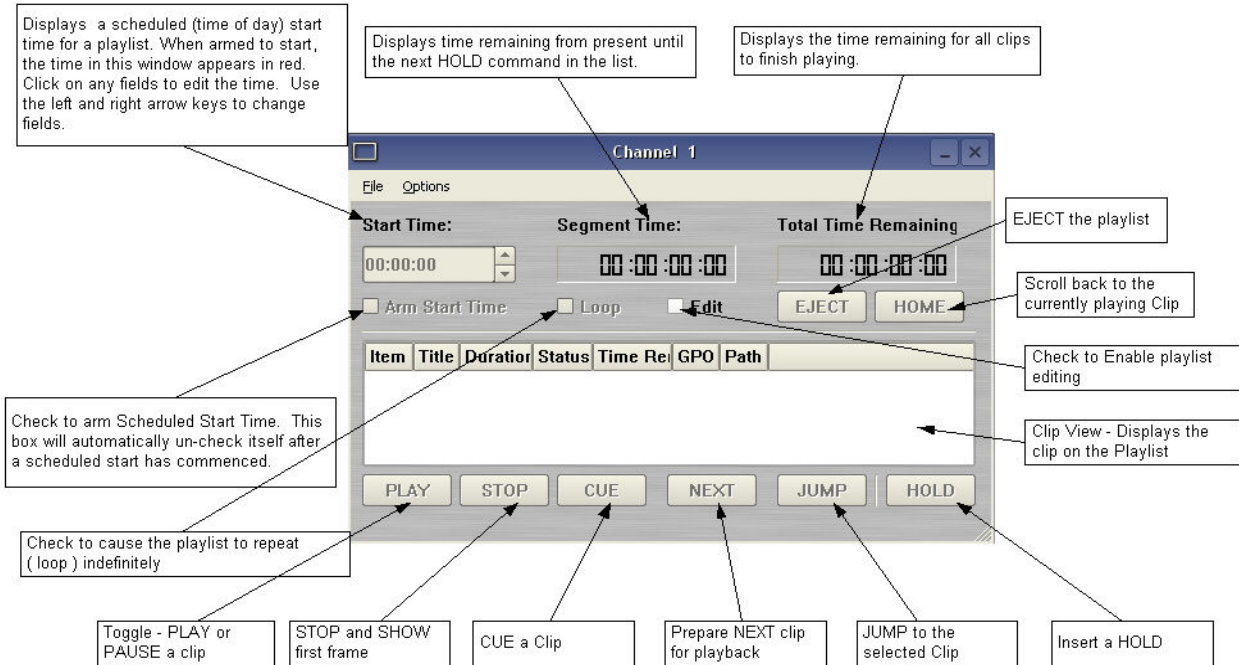
MAXX-2400HD's Advanced Playlisting software provides extensive tools for building, editing and playing complex sequences of program content. Advanced Playlisting appears as on-screen windows, with an intuitive Graphic User Interface that makes it easy to operate without extra equipment. It's invaluable for building commercial breaks, news rundowns, still-store and clip lists. The server will create and store as many playlists as needed, each with its own unique name. For many users, Advanced Playlisting may be all that's needed to go to air.

The following features are included:

- Drag-and-drop playlist building and editing on a graphic interface
- Edit lists while they're running
- Start at any point in a list
- Displays run time for clips, plus segment length and total remaining time
- On-the-Fly commands for Pause, Skip, Hold, Next and Jump functions
- Append a playing list with a saved playlist
- Up to 12 programmable GPI Output events embedded in playlist clips
- Programmable time-of-day start for a playlist
- Generates an As-Run Log
- Setting rules for deleting old material on the playlist
- Simple text format allows playlists to be created, viewed and edited offline
- FTP access allows playlists to be transferred between servers, or to/from a PC

## The Playlist View

The playlist view for channel 1 is shown in Figure 22. Its functions are briefly described here. Table 1 provides an overview of Playlist control functions and their associated hot-keys.



**Figure 22 - Channel 1 Playlist View**

FUNCTION	DESCRIPTION / REFERENCE	INVOKE	HOT-KEY
<b>PLAY/ PAUSE</b>	Play / Pause a clip ( Page 46, 64 )	PLAY Button	P or SPACE
<b>STOP/ SHOW</b>	Stop / Show First Frame ( Page 64 )	STOP Button	S
<b>CUE</b>	Cue a clip ( Page 64 )	CUE Button	C
<b>NEXT</b>	Prepare next clip for playback ( Page 64 )	NEXT Button	N
<b>JUMP</b>	Jump to the selected clip ( Page 64 )	JUMP Button	J
<b>LOOP</b>	Check to loop a Playlist ( Page 64 )	LOOP Checkbox	L
<b>EDIT</b>	Check to enable editing ( Page 65 )	EDIT Checkbox	E
<b>ARM START TIME</b>	Enable Scheduled Start Time ( Page 63 )	ARM START TIME Checkbox	T
<b>HOME</b>	Scroll to currently playing Clip ( Page 64 )	HOME Button	H

**Table 1 - Playlist Control Functions**

## Creating and Running a Playlist

To Create a Playlist (Using Channel 1 in the example):

1. Change the transport for Channel 1 to the **Playlist View**. Click **FILE->PLAYLIST** in the Channel 1 transport pulldown menu. The window of Figure 23 appears.
2. Click the **EDIT** check box to put the channel into edit mode.
3. Click **SHOW->CLIP LIST** from the main menu to open the Clip Navigator. Both windows are now visible.
4. Double click on a clip in the Clip Navigator to add it to the Playlist. The clip will appear in the playlist. The first clip will indicate a status of **CUED**. Alternately, click on any clip and hold the mouse button as you move the cursor to the playlist. Let go of the button when the cursor is over the position that you want the clip to appear in the playlist (drag and drop).
5. Repeat the procedure to add more clips.

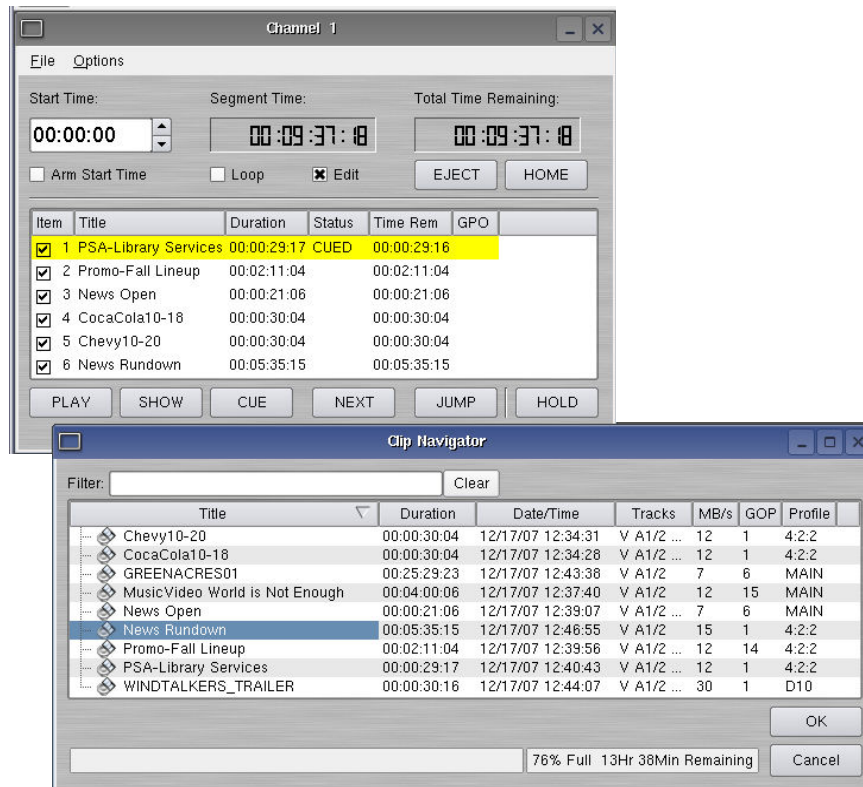
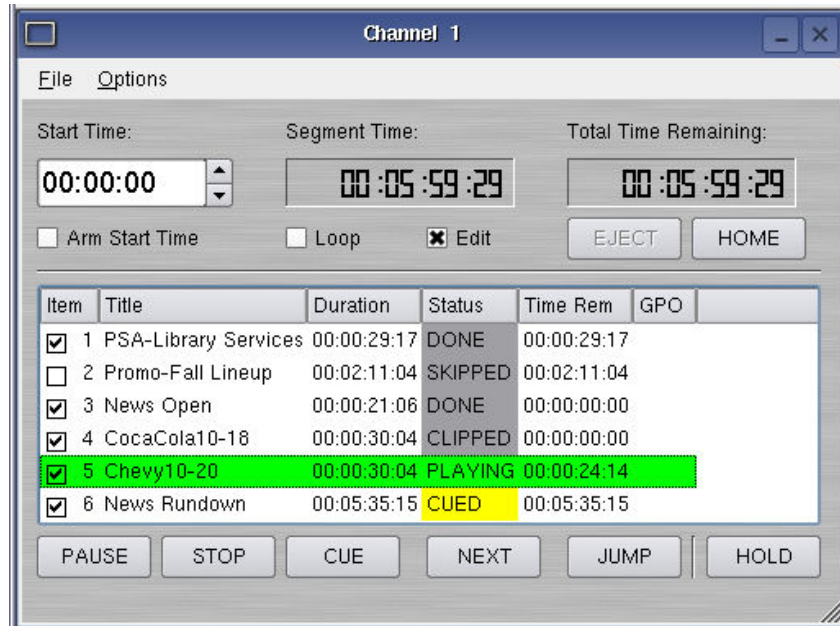


Figure 23 - Channel 1 Playlist with Clip Navigator

6. Click **PLAY** to run the playlist. The clips will be played in the order they were entered in the playlist. The currently playing clip will indicate a status of **PLAYING**. The next clip on the list will indicate a status of **CUED**.





**Figure 24 – Active Playlist**

7. To **SAVE** the Playlist select **FILE->SAVE-AS**. Enter a file name. Click **SAVE**.
8. To **SAVE** an existing playlist without changing the name, use **FILE->SAVE**.

## Loading a Playlist (FILE > OPEN)

Click **FILE->OPEN** from the Playlist View to bring up the list of available Playlists. Double-click on a playlist to load it.

## Saving a New Playlist (FILE > SAVE AS)

Once a Playlist has been created, it can be saved by selecting **FILE->SAVE AS** from the Playlist View pulldown menu. Type in an appropriate name and click **SAVE**.

## Saving an Existing Playlist (FILE > SAVE)

An existing Playlist can be saved by selecting **FILE->SAVE** from the Playlist View pulldown menu. Type in an appropriate name and click **SAVE**.

## Setting a Start Time for a Playlist

Set a start time for a Playlist by entering a twenty four hour time of day in Hours, Minutes and Seconds in the **START TIME** field (see Figure 22 ). Click on any field to edit the field. Check the **ARM START TIME** checkbox to arm the start time. The **ARM START TIME** checkbox will automatically uncheck itself once the playlist has started.

Triggering the Start Time is essentially the same as pressing the Play button, so it is possible to arm the start time while a list is playing, have the playback stop from a Hold or GPI Stop, and then restart when the Start Time triggers playback.

## Stopping a Playlist (STOP)

Click **STOP** to halt a Playlist.

## Pausing Playlist (PLAY/PAUSE)

When a Playlist is running, the **PLAY** key will change to indicate **PAUSE**. Pressing **PAUSE** stops the Playlist immediately, on the current frame of a clip. Pressing it again will resume playback.

## Cueing Clip (CUE)

When the Playlist is running, click **CUE** to immediately prepare a selected clip for playback. When the current clip is finished playing, the Playlist will play the Cued clip, followed by all subsequent clips. This allows the user to skip over clips that appear in the list between the currently playing clip and the selected clip.

The user may also re-cue a clip that has already been played. In this case, the Playlist will restart from the selected clip, and all subsequent events will be played (or re-played) in sequence. When the Playlist is stopped, CUE will prepare the selected clip to play when Play is pressed, or the list is started automatically by Arm Start Time.

## Looping Playlist (LOOP [X] )

To loop the entire playlist after the last clip completes, check the **LOOP** checkbox at any time. Upon un-checking, the list will play to completion and then stop.

## Showing First Frame of CUED Clip (SHOW)

When a clip is cued, the **STOP** button legend changes to **SHOW**. Pressing it will display the first frame of the cued clip.

## Preparing Next Clip for Playback (NEXT)

When a Playlist is stopped, click **NEXT** to prepare the next clip in the Playlist for playback. While the Playlist is running, NEXT will immediately begin playing the next cued clip in the Playlist. (The next clip may require several seconds to load and cue for a seamless transition.) If the next event in the Playlist is a HOLD, the NEXT command will move to the Hold event, and video will display black.

## Jumping to Selected Clip (JUMP)

Click **JUMP** to cue any selected clip for immediate playback; this permits jumping over intervening clips. JUMP also allows clips that have already been played to be immediately re-cued and played. In this case, the Playlist will restart from the selected clip, and subsequent events will be re-played in sequence.

## Scrolling to Currently Playing Clip (HOME)

Click **HOME** to make the currently playing clip visible in the Playlist View window. If no clip is playing, then the currently-cued clip is displayed. This is helpful if you have manually scrolled elsewhere in a large Playlist. Once this is done, the display will also maintain the currently-playing clip within the window, if EDIT is off



## Set Maximum Number of Items to Keep

To set the number of played items to be retained in a playlist: Click **OPTIONS>CONFIGURE** from the Playlist View of the channel pulldown. Use the thumbwheel UP and DOWN scroll button to increase or decrease the number of clips to retain. The default value of zero will retain ALL Clips.

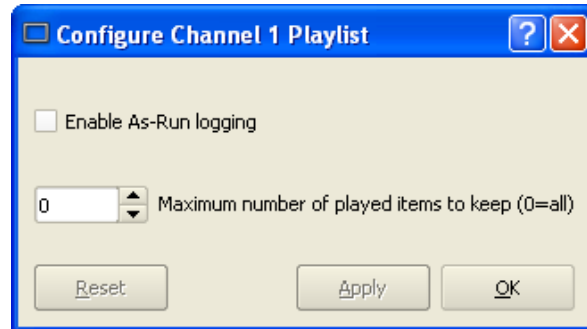


Figure 25 - Channel Playlist Configure Screen

## Enabling As-Run Logging

To enable As-Run logs, Click **OPTIONS>CONFIGURE** from the Playlist View of the Channel Transport. Check the Enable As-Run logging checkbox to enable As-Run logging. Uncheck the box to disable As-Run logging. When enabled, a check mark will appear next to the As-Run log label, and files played by a playlist will be written to an As-Run log. As-Run logs are available only through FTP downloads; they cannot be viewed or printed from the server. After logging into a server, select the ASRUN folder. All logs are stored in this location, and have the extension “.arl”.

Refer to **APPENDIX E – AS-RUN LOGGING** for more details about As-Run logging functionality.

## Viewing, Editing and Archiving Playlists

Playlists can be accessed via the server’s FTP feature, allowing several capabilities:

- Lists can be backed up on a PC, and sent to another server.
- Lists can be viewed and printed from the PC
- Lists can be edited or created on the PC and uploaded to the server.

Playlists are found on the MAXX-2400 FTP directory in the lists folder. They are simple text files with the extension .LST. Refer to Appendix D

Playlist Management for more information.

## Editing Playlists

### Removing Clip from a Playlist

To remove a Clip from a Playlist:

- Make sure the clip to be removed is not PLAYING or CUED.
- Position the cursor over the Clip and right-click. Select **REMOVE** from the pulldown menu.

## Removing Clips Above or Below the Selected Clip

All clips above or below the selected clip can be removed unless a **CUED** or **PLAYING** clip is affected. These options will “grey out” if removal is not allowed for this reason.

To Remove All clips above a selected clip:

- Move the cursor over the clip to select it.
- Right click the mouse and select **Remove All Above** from the pulldown menu.

To Remove All clips below a selected clip:

- Move the cursor over the clip to select it.
- Right click the mouse and select **Remove All Below** from the pulldown menu.

## Inserting HOLD Into a Playlist

The HOLD command inserts a hold (wait) event in a Playlist immediately *before* the selected clip. The PLAY or JUMP command will restart a Playlist after it has stopped on a HOLD line. The HOLD command is also available in the Playlist Item Context Menu, accessed by right-clicking in the Playlist item window. If a Programmed Start Time has been set and is armed, the Playlist will resume when the Programmed Start Time occurs. See Page 63 for instructions on setting a programmed start time.

## Appending a Playlist (FILE->APPEND)

Make sure the **EDIT** checkbox is checked in the Playlist View window. Click **FILE->APPEND** from the Playlist View to bring up the list of available Playlists. Double-click on a playlist to load it. It will appear at the end of the list after a label event that shows the name of the appended list. This operation can be performed during playback, allowing a new playlist to be loaded without interruption of programming.

## Changing Duration of Clips in Playlist

Make sure the **EDIT** checkbox is checked in the Playlist View window. Position the cursor over a clip and right-click. Select **EDIT DURATION** from the pulldown menu. **Enter a duration** in the Duration window. The minimum duration is 4 seconds. The entry may be in one of these formats:

1. Hours, Minutes, Seconds and Frames entered as HHMMSSFF  
04300102 = 4 Hours, 30 minutes, 1 second, 2 frames
2. Hours, Minutes, Seconds and Frames entered as HH:MM:SS:FF  
03:39:41:17 = 3 Hours, 39 minutes, 41 seconds, 17 frames
3. As a whole number along with the special characters H for hours, S for seconds, M for minutes  
7H would set 7 hour duration. 31m would set 31 minutes. 15s would set 15 seconds.

**NOTE:** The Clip duration is affected only within the Playlist, for this event. The duration of the source clip is not changed. Other events containing the same clip are not changed.

## Mapping GPO to Playlist Events

The MAXX-2400HD has twelve General Purpose Outputs, referred to as GPO 1 through 12. Any of these can be programmed to go active at a pre-determined time, or *offset*, after the beginning of a Playlist clip. An active *duration* can also be set, after which the output again goes inactive. **In all cases, every output will go inactive when a clip ends.** By default, a new clip contains no programmed GPO output commands. Refer to APPENDIX A – CONNECTOR SPECIFICATIONS for details on electrically interfacing to the GPO lines.

To Map a Playlist event to a GPO Line, Follow these steps.

- A. Select **EDIT > CONFIGURE->GPO**. The screen of Figure 26 is displayed. GPO 1 through 12 are the 12 triggerable outputs. The checkboxes to the right of each selection represent channel 1, 2, 3 and 4. GPO 9 is shown with the trigger option pulldown expanded.
  - a. Set the GPO of interest to **PLAYLIST** mode from the pulldown menu.
  - b. Set the Channel to video 1, 2, 3 and/or 4 by checking the appropriate box to the right. Click **APPLY** to activate the settings.
- B. Check the **EDIT** checkbox in the Playlist View of the transport.
- C. Place the cursor over a Clip in a Playlist. Right click on the clip. Select **EDIT GPO**. The GPO Editor (Figure 27 ) appears.
- D. Enable the GPO of interest by checking the corresponding **ENABLED** checkbox.
- E. Enter an offset into the Clip to activate the GPO line in the Offset Field. The form of the field is Hours, Minutes, Seconds and frames. ( HH:MM:SS:FF )
- F. Enter the Duration for the GPO to remain active in the Duration Field using the same format. Click **APPLY** to activate the changes.

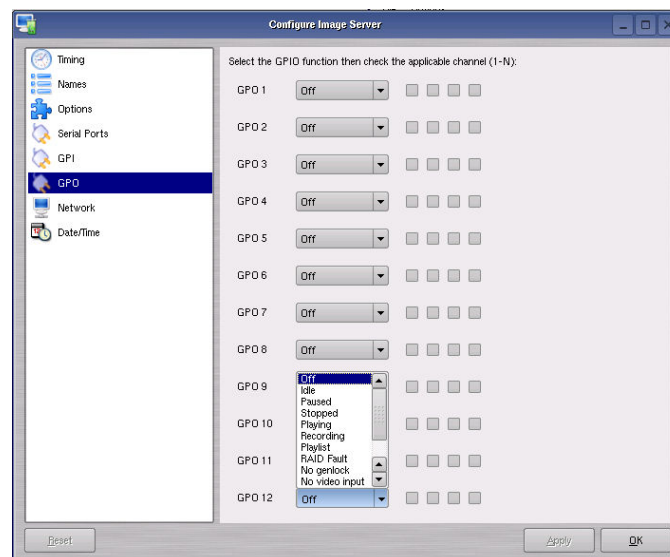


Figure 26 - GPO Configuration Screen

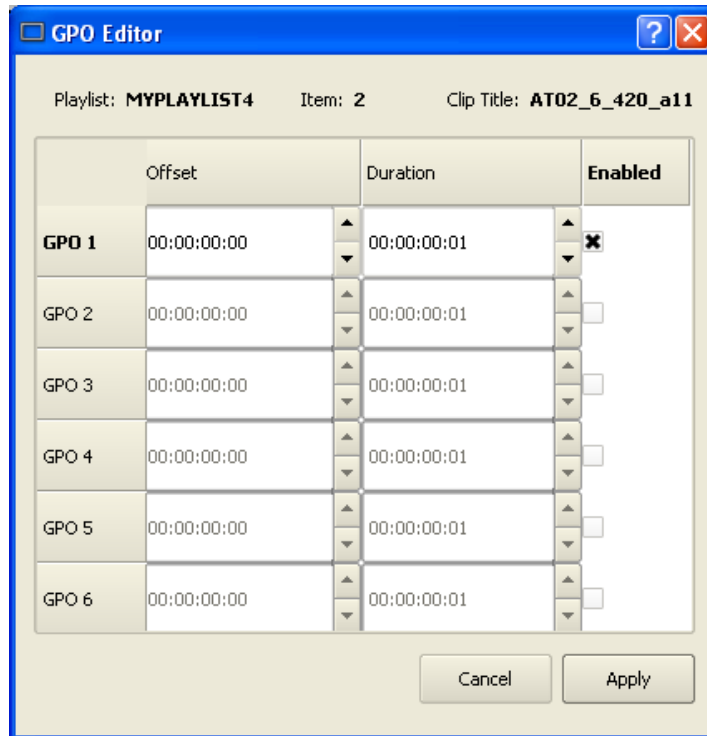


Figure 27 - GPO Editor

## Mapping GPI to Control a Playlist

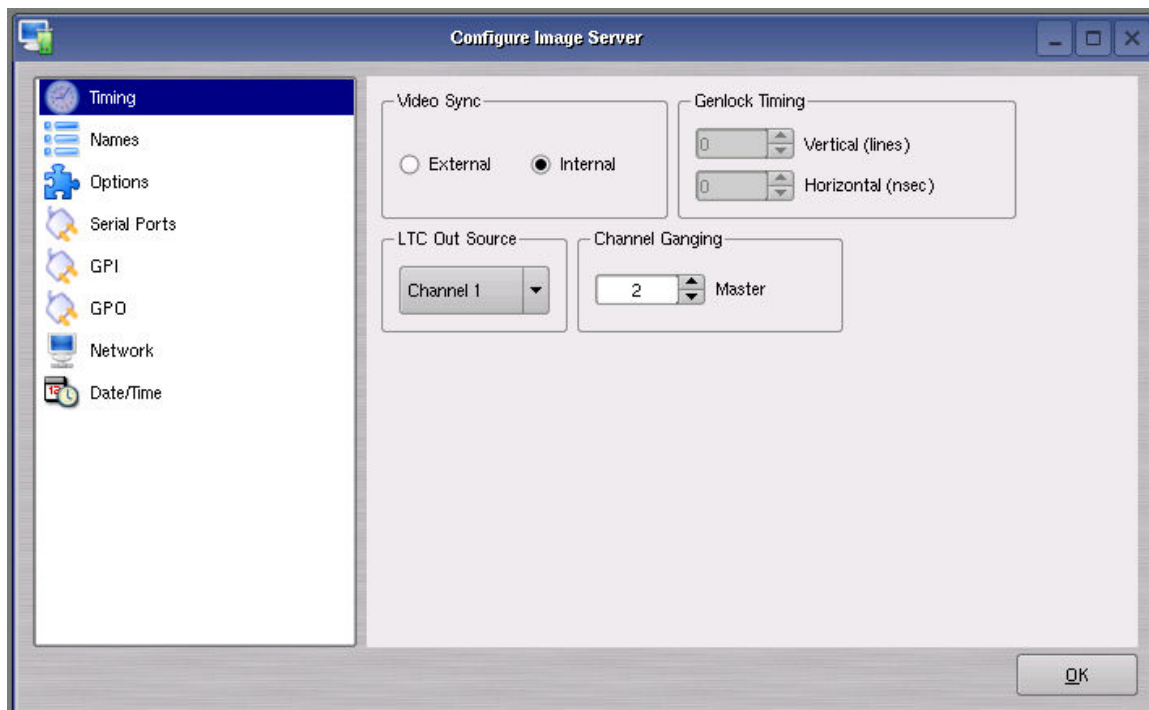
Playlists can be controlled with the twelve GPI Inputs. See Programming GPI Inputs on page 53.

# Advanced Topics

## System Timing

The MAXX-2400HD is equipped for use with an external genlock signal as a timing reference. This causes all outputs to be synchronous with other video signals in a facility.

Adjustment of Genlock Lines will fine tune this synchronization to compensate for differences in equipment and wiring. This global setting for all outputs allows timing to be varied by one line of video. *This rarely if ever needs to be adjusted.* If required, it would be adjusted so that the output of the first line of video happens concurrently with other contributing inputs. The visible effect is that the picture will rise or fall by one line when viewed at the output of a video switcher, or on a genlocked monitor. Note that this setting can cause VANC data to appear on different and possibly inappropriate lines.



**Figure 28 - Video Timing Adjustment**

## Using Embedded Audio

The MAXX-2400HD provides 8-channel embedded audio capability. Features include:

- Synchronous 20-bit audio at a 48K sample rate. Non-genlocked audio and other sampling rates are not supported.
- The server records and plays Group 1 and 2 audio, (channels 1-8). Up to 16 channels of audio may be present in some HD-SDI streams.
- In E-E mode, all embedded audio channels will pass through the server unaltered.
- The user can select an audio source from the embedded audio, from the optional AXP-3 and AXP-4 multi-channel analog audio modules, or from the optional DXP-1 multi-channel AES/EBU digital audio module. Mix-and-match among inputs is not supported.
- Regardless of the source recorded, embedded audio is always inserted in the HD-SDI stream on playback, even when the primary audio output will be analog or AES/EBU audio.
- User bits in the HD-SDI embedded audio stream are not supported.
- 20 bit Dolby®-E is supported with 360 Systems' Bit-for-Bit® technology.

## Using Audio Sample Rate Conversion

A check-box is provided to engage built-in sample rate converters for incoming AES/EBU audio tracks, which are then converted to a 48K broadcast standard synchronized by video genlock. Sample Rate Conversion does not apply to analog or Embedded audio.

The sample rate converters should be used in any of these cases:

1. The incoming digital audio and video are not referenced to genlock.
2. The sync reference is set to INTERNAL.
3. The incoming digital audio is not at a 48 KHz sample rate.

## Gangng Channels for Synchronized Playback

Two video channels can be ganged together for frame-accurate playback. This may be used for key and fill material (either stills or clips), or multi-channel playout of presentations, such as synchronized matte backdrops on News Broadcasts, or multi-screen projection of related images.

The channels can be ganged in the following combinations:

- Channel 1 controls Channel 2 and/or Channel 3 and/or Channel 4.
- Channel 2 controls Channel 3 and/or 4
- Channel 3 controls Channel 4

To configure Channel Ganging Click **EDIT->CONFIGURE->TIMING** from the Main Menu. The video timing adjustment screen on page 67 is displayed. Two examples of this are:

- To gang Channel 1 to channel 3, set **CHANNEL GANGING MASTER** to 1 and click the **GANG** checkbox on channel 3.
- To gang Channel 3 to channel 4, set **CHANNEL GANGING MASTER** to 3 and click the **GANG** checkbox on channel 4.

## Using Ganging for Key-and-Fill or 3D Playback

Channel Ganging is used for frame-accurate playback of stills animated sequences that have an alpha, or key, channel. These in turn are fed to a downstream keyer or video effects generator, to be combined with other video content. Manual or automated control of the Master channel is all that is needed to play both the key and the fill. The MAXX-2400HD can also be used to play two synchronized channels for 3-D applications.

Key and fill clips are associated by their names. The Key Clip must have the same name as the Fill Clip with a trailing underscore. Example:

Fill clip name: myfile

Key clip name: myfile\_

There is no provision for automatic loading of similar named clips on more than two channels—the Master channel and the next higher numbered Ganged channel.

Proper key and fill operation requires two clips of identical length. This can be accomplished by editing with head and tail trim.

Channel 3 is ganged to Channel 4 in the following example:

When a clip is opened/cued on Channel 3, the server automatically looks for another clip with the same name, plus a trailing underscore. If the clip is found, it is loaded on Channel 4. The Channel 3 clip contains the “fill” material, while the Channel 4 clip contains the “key” (or alpha) file.

An automation system could, for example, issue a VDCP Cue command to Channel 3 for a clip called “logo”. Channel 4 would automatically be loaded with clip “logo\_”. A Still or Play command sent to Channel 1 would cause both Channels 1 and 3 to display the fill and key clips, respectively.

Note that the VDCP checkbox option to “show first frame” for a Cue command is ignored for channels in ganged mode. The automation system must issue a Still command to Channel 1 to achieve this effect.

Ingesting a TARGA file via FTP automatically creates a key clip and a fill clip, each a single frame in length. For example, if file “xyz.tga” is transferred to a server via FTP, then a pair of single-frame clips is created: “xyz” and “xyz\_” containing the fill and key material.

## Combined Video and Graphics Capabilities

MAXX 2400HD includes graphics import capability, enabling the server to function as both a graphics still-store, and an animation playout server. Its four outputs give it the power to provide key-and-fill material along with two additional video feeds simultaneously.

The server supports FTP import from most graphics systems, including Photoshop®, After Effects®, Final Cut Pro®, Xpress Pro™, Liquid Edition and Vegas Video.

## Importing TARGA Graphics Files

The server will be able to recognize and ingest single-frame TARGA files via FTP from many network-attached graphics workstations. TARGA files have a .tga extension, and may contain an alpha (or key) channel. During transfer, the server will split the TARGA file into a Fill frame, and a Key frame if it exists. These will be converted to high-resolution files, one frame in length.

For example, if an original file is named Logo.tga, the files created will be named Logo.mxf (the fill file) and Logo\_.mxf (the key file). Note the trailing underscore “\_” added to the file name of the key. This allows the TARGA file to be used for key and fill applications when channels 2 and 3 are ganged together.

The resolution of a TARGA image should be 1920 x 1080 for use in 1080i format, or 1280 x 720 for use in 720p format. If the original TARGA image is not of this resolution, the server will re-scale it, possibly introducing some dimensional distortion. The bit depth of the files must be 24 or 32 bit. The server does not support Targa sequences, only single frame graphics.

## Animation Import (.mov files)

From the server’s standpoint, an “animation” is a clip with a minimum length of two seconds. Clips used for sequential (back-to-back) seamless playback must be a minimum of four seconds long. A separate Alpha channel may or may not be present. Any graphics workstation capable of exporting files supported by the server can make transfers to it via FTP. If an alpha channel is present, the naming conventions of the Key/Fill Mode apply: the file name for the key video is the same as the filename for the fill video with the addition of an underscore character (\_). Many software programs have the ability to create content compatible with the server, including Final Cut Pro®, Avid® Xpress, Liquid Edition, Vegas Video; and Adobe® After Effects®, Premiere® and Photoshop®.

Animation sequences to be sent to the MAXX-2400HD should be saved in QuickTime format with either no compression or with Run Length Encoding enabled. The image size should be 1920x1080 or 1280x720. An alpha channel may be present.



The resulting .mov file may be sent to the server by FTP, logging in as user “anonymous” or “ftp”. No password is required. After the transfer completes, the server will render (encode) the .mov animation sequence into a pair of JPEG-2000 clips (key and fill) that are playable on the server. This is a somewhat time-consuming process, so it takes place in “background mode”. The GUI status bar indicates the clip being processed. When finished, the clip name will appear in the GUI clip list, ready for playback.

## Still Frames

A single-frame clip (a “still”) may be inserted into a playlist. The length of a still will appear as one frame in the clip list. When a still is encountered, the playlist will pause and hold the still image until a Play command is issued, at which point the playlist will continue to the next clip in the list. When using the GUI, the space bar (a keyboard shortcut) will also advance the playlist. Stills may be placed anywhere in a playlist. In fact, a playlist may be entirely composed of stills.

A still frame clip in a playlist can have a duration assigned to it (See page 66 ). It will then play for that duration and the list will continue automatically.

Stills are created when TARGA files are ingested. (See page 76 for a description of TARGA file ingest.) It is also possible to create a still frame by editing any clip. When editing the clip, position the transport on the desired frame and set both the In and Out points to this frame. Save the clip, or Save As to a new clip name. The selected frame will be displayed when the clip is played in the Playlist.

## FTP File Transfers

The MAXX-2400HD connects over Gigabit Ethernet using an RFC-1359 compliant FTP server. File transfers to and from the server are managed from an FTP client file transfer program running on a Windows® or Macintosh® computer. This provides a rapid way to execute drag-and-drop file transfers; it can also manage many servers at once and does not tie up the server GUI, which may already be in use. Table 2 indicates the supported FTP client list.

FTP Client	Version	Platform
Flash FXP	3.2.0	WINDOWS XP, WIN2K
DOS FTP	5.1.2600	WINDOWS XP, WIN2K
WS FTP	5.08	WINDOWS XP, WIN2K
Internet Explorer	6.0.2900	WINDOWS XP, WIN2K
Fetch	5.2	MAC OSX
CyberDuck	2.7.3	MAC OSX

**Table 2 - Supported FTP Clients**

FTP programs may also be used to move recorded or edited material between a server and Network Attached Storage (NAS) or a DVD-ROM library.

From a networking or system-integration viewpoint, the server appears as a normal FTP server in any size network, with the exception that it may only send, receive, or store video files that are compatible with the server.

**The server is designed to be used in a private dedicated video network. A firewall must be used in systems that require internal security or connection to public networks. Consult with a network security specialist for guidance on the best hardware, programming and practices for your facility's requirements.**

### Gigabit Ethernet Cable Quality

The high data rates generated by Gigabit Ethernet require high-quality cable designed for this application. Low-quality network cables can result in high error rates and lower transmission speed. For Gigabit operation, standard CAT-5 cable should be used only for very short cable runs.

New Category 5e (enhanced) cables ensure maximum transfer rates, and should be used as the minimum standard. Category 6 cable is a good choice for applications where longer cable runs are required.

### Configuring the FTP Interface

Before logging in to the server's FTP server, the network must be configured according to the local network topology. This is primarily a matter of setting a static IP address or configuring the server to use DHCP to obtain an IP address from a DHCP server. Refer to page 54 for details on configuring the network settings.

When connecting directly to a PC or Laptop, configure the server as IP address 192.168.1.3, netmask 255.255.255.0 and disable DHCP. In the PC, double click on the Local Area Connection Icon in the system tray or in the Network and Dial-Up Connections in the Control Panel. In the Local Area Connection Status dialog, click on Properties. Click on the item "Internet Protocol (TCP/IP)" and click on Properties again. In Local Area Connection Properties, turn off "Obtain an IP Address Automatically" by selecting "Use the Following IP Address" and set the address to 192.168.1.2, netmask to 255.255.255.0.

No hardware settings are available or needed. The **NET-1** port automatically negotiates port speed and configures transmit and receive connections, and does not need a "crossover" cable when connecting directly to a PC.

The actual transfer rate depends on the format of the files being transferred, the number and bit rate of video streams being played.

### Logging In to the Server FTP Service

The server allows only for anonymous login. Using one of the FTP clients shown in **Table 2**, enter "anonymous" as the user name or check the "anonymous" checkbox on the login screen.

When the FTP client is connected, it will display the Clips in the main directory and all of the sub-folders. Clips can be uploaded, downloaded, deleted and renamed using standard FTP client commands. Clips in the subfolders can be displayed by entering those folders. Consult the documentation for your FTP client for information on changing folders.

### File Sizes Reported in Listing

The size of a clip reported in the file listing is the amount of video and audio data included in the entire clip, regardless of the settings of the In Point and Out Point.

### Overwriting Files

It is the responsibility of the client application (Windows Explorer, FlashFXP, etc) to ask the user if they want to overwrite a file.

Note that some types of files (such as .mov and Targa) change their file extensions when they have been transferred into the server. In these cases, the FTP client **cannot warn of a file overwrite**. It is important to take extra care when using these types of files not to overwrite necessary files.

### Interrupted and Resumed Transfers

If a transfer is interrupted (for example, by a dropped connection), the amount of the file that has been transferred is kept on the target system. Resumption of a partial transfer is possible if the FTP client supports it.

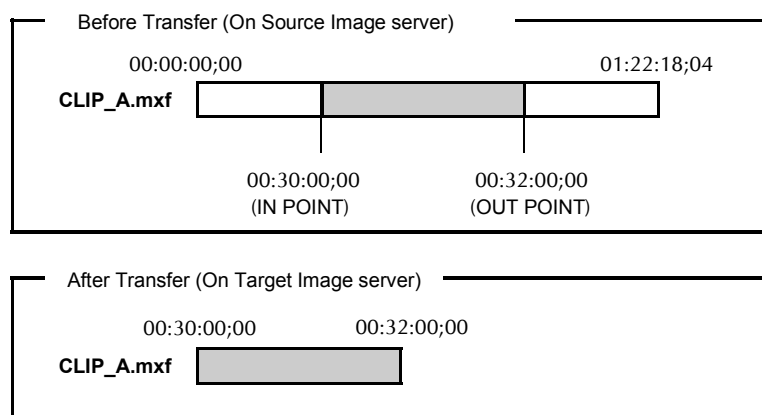
## Transfer of Edited Segments

The server sets MARK-IN and MARK-OUT points in a clip as “edit pointers.” For all edit operations within a given server, these pointers produce “virtual edits” that save disk space, and the time it would take to re-write the marked region as a new file.

When transferring clips via FTP, the entire clip is transferred.

To maintain the identity of the transferred clip, the time code references for its Mark-In/Out points are maintained, as shown in **Figure 29**.

When transferring edited material, keep in mind that you are making copies of the data on the target device. While subclips that reference the same video content on the original recordings take up minimal extra disk space, they could take considerably more space on the target storage.



**Figure 29 – Result of a network file transfer**

## Supported file types

MAXX-2400HD recognizes media file types by their file extension. It is important that the file extension properly identifies the file content. Attempts to send a file in one format but masquerading as another due to a wrong file extension may result in undefined behavior. The following formats are supported:

### JPEG 2000 (.vcf)

As of this writing, the JPEG-2000 file is .vcf (360 Systems) format. Near-term software releases will provide file exchange capability with JPEG-2000 products from other companies.

### MOV (.mov)

**MOV-wrapped graphics can be imported and rendered for playback as JPEG-2000 files.**

Animation sequences to be sent to the MAXX-2400HD should be saved in QuickTime format with either no compression or with Run Length Encoding enabled. The image size should be 1920x1080 or 1280x720. An alpha channel may be present.

### **TARGA (.tga)**

24 or 32 bit format. (16 bit format is not supported.) During transfer, the TARGA file will be split into a Fill frame and a Key (Alpha) frame. These are saved as two separate JPEG-2000 video clips, each one frame in length. The clip name for the fill frame is the base name of the .tga file, while the key frame has this name with an appended underscore character. The resulting files will be available as MXF files for subsequent FTP transfer.

### **Playlists (.lst, .txt)**

A server play list is a text-based file residing in the “/lists” directory. Playlists can be created off-line and transferred to the server using FTP. See page 130 for further information on Playlist file editing and management.

### **As-Run Logs (.arl)**

As-Run logs are available from FTP to confirm the operation of the server Advanced Playlist feature. See page 65 for further information on using As-Run logs.

# Network Time Protocol

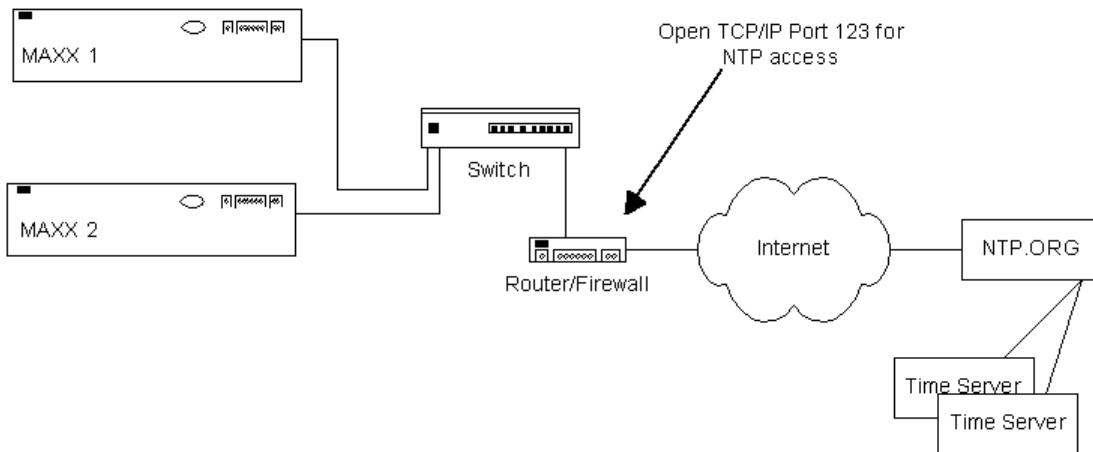
## Automatic Date/Time Updates

When using server play-lists in broadcast applications, an accurate record is often needed of what was played and when. The server's As-Run logging feature creates such a record, time stamping each played clip using the machine's internal date/time clock. Very accurate time stamping can be achieved by synchronizing the server's clock to an external time base that is referenced to Coordinated Universal Time (UTC).

This is accomplished using the Network Time Protocol (NTP) to interrogate time servers through a network connection. A time server could be an in-house computer that is equipped with a GPS receiver, or a radio receiver locked to signals from the NIST radio station WWV. Alternatively, public time servers may be used which are accessible through an Internet connection.

## Connecting to the Network

To obtain automatic date/time updates from the public time servers on the Internet, you will need to provide the server with Internet access. Generally, servers would be connected on a secure high-speed local area network, with any Internet connection going through a router with an integrated firewall. The Network Time Protocol uses TCP/IP port number 123, so be sure the firewall is configured to allow access to this port per Figure 30.



**Figure 30 - NTP Network Block Diagram**

## Configuring NTP

The server GUI is used to set the time zone and to enter the networking parameters. The local GUI must be used, as these configuration screens are not available on the Remote Workstation Interface.

## Selecting the Time Zone

Starting at the main menu bar, Click **Edit->Configure->Date-Time** screen. When “Automatic Updates” is not checked, the Region and Zone lists are enabled. Select your region and then the zone within that region. There may be more than one way to your zone; America/New York, for example, is the same as US/Eastern. Click the **APPLY** button to activate the settings,

After changing the time zone a Quick Restart must be performed before changes become effective.

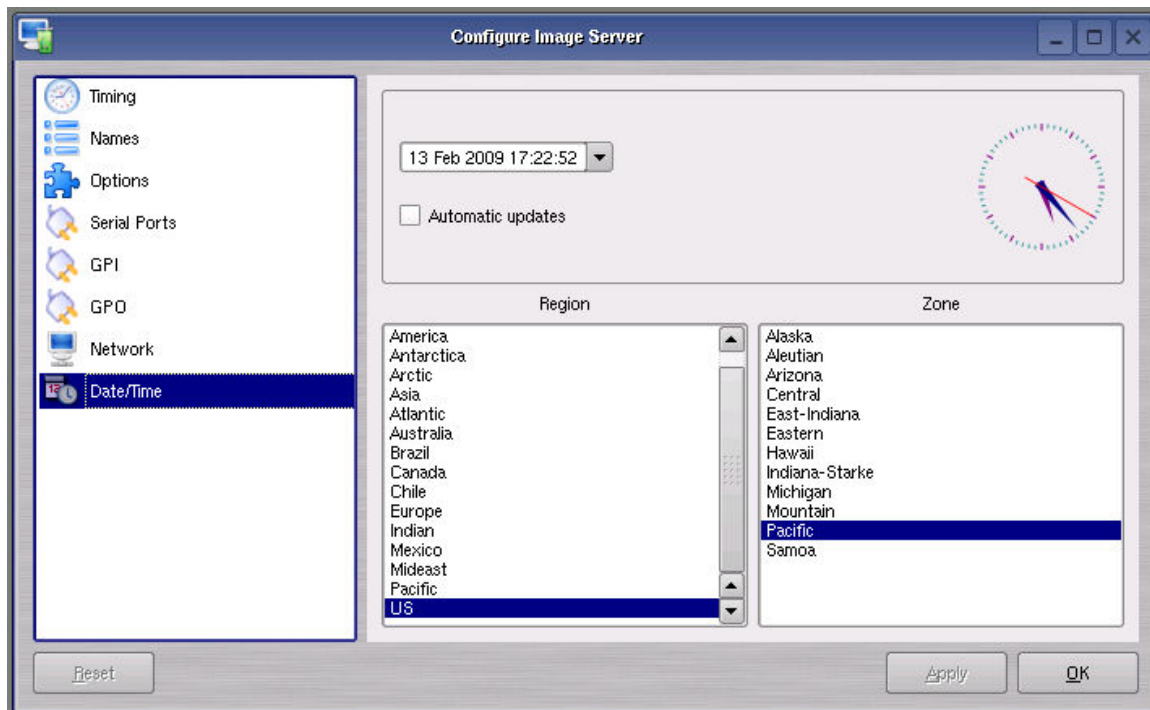
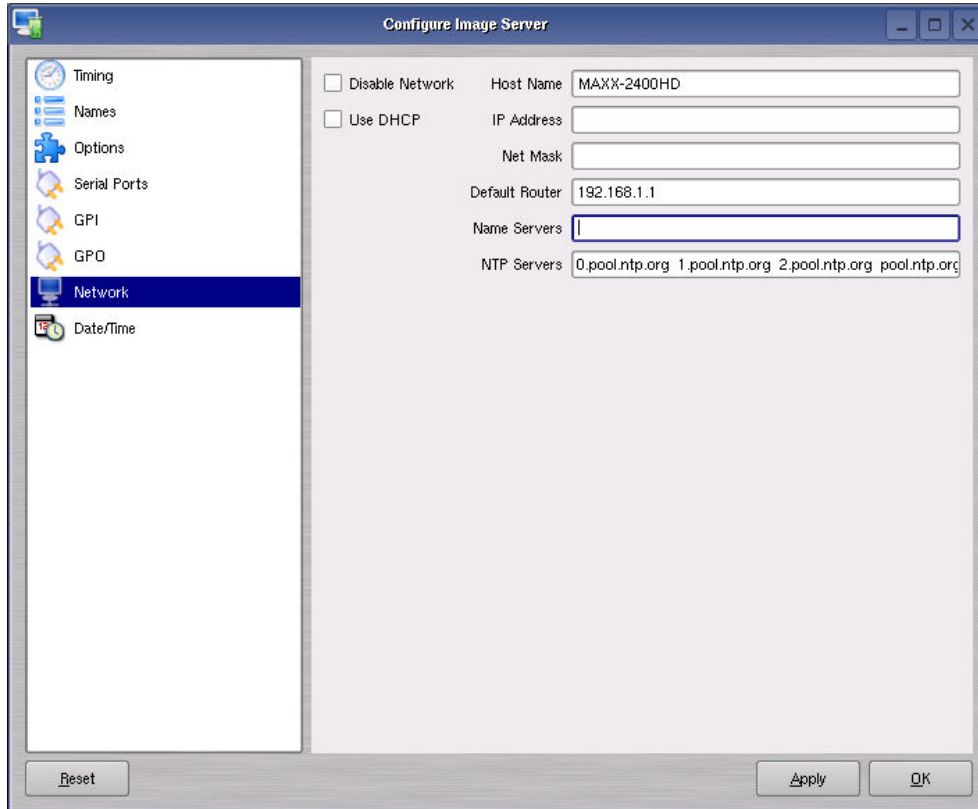


Figure 31 - Date/Time Configuration Screen

## Entering Network Parameters

From the GUI's main menu bar, Click **EDIT > CONFIGURE > NETWORK**. The following screen appears. Make sure the basic network parameters have been entered.



**Figure 32 - Network Configuration Screen**

*Disable Network:* uncheck

*Host Name:* (Any name will suffice, but since this name appears on each line of the server's diagnostic logs, it is a good idea to keep this short.) The name should also be unique from other devices on the network.

If "Use DHCP" if not checked, then enter a fixed IP address compatible with your local subnet. For example,

*IP Address:*                192.168.1.20  
*Net Mask:*                 255.255.255.0  
*Default Router:*         192.168.1.1

The *Name Servers* and *NTP Servers* fields provide the information needed to reach the public time servers.

The *NTP Servers* field contains a list of time servers, either by numeric IP address, or by site name (URL). Entries are separated by spaces.



The nonprofit Internet Systems Consortium, Inc. (ISC) maintains sites that automatically return lists of public time servers to an NTP client such as the server. Hence, the *NTP Servers* field is initially filled in with the URL's for these sites (0.pool.ntp.org, for example). Of course you can overwrite this list with the addresses of specific time servers you may want to use. However, if you try to clear the *NTP Servers* field it will be reset to the default list.

**Note:** When URLs (non-numeric site address such as pool.ntp.org) are used in the *NTP Servers* field, you must provide the IP address of at least one DNS (Domain Name server) in the *Name servers* field. Typically, this address is supplied by your Internet Service Provider.

These name servers translate URL names into numeric IP addresses needed to access the sites in question.

When using a GPS-based time server which is connected directly to a local area network, enter its numeric IP address (such as 192.168.1.60) into the *NTP Servers* field, leaving the *Name Servers* field blank.

Also, if you know the numeric IP addresses of the public or corporate time servers on the Internet, you can enter these addresses, separated by spaces, in the *NTP Servers* field, leaving the *Name Servers* field blank, since there would be no URLs to be resolved.

**Note:** Not all Time servers allow unlimited public access. Refer to [www.ntp.org](http://www.ntp.org) for more information.

Click the **APPLY** button to save your changes.

# Automation Control

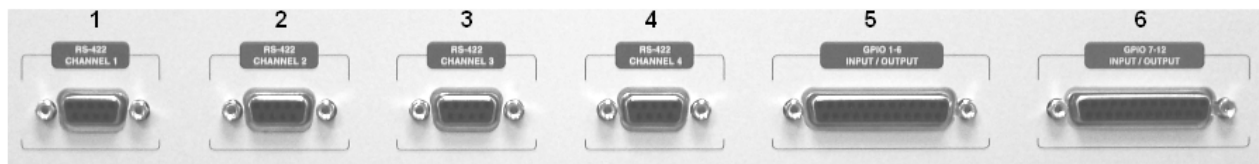
MAXX-2400HD's serial control inputs connect with many broadcast automation systems, instant replay panels, video switchers, and remote control devices.

For compatibility with simple controllers and push buttons, the server also provides 12 GPI (contact closure) inputs, and 12 programmable command outputs.

## Remote Serial Control

The server's four 9-pin RS-422 serial control inputs permit control of their associated video channels. The following serial protocols are accepted::

- VDCP
- BVW
- ODETICS Extension to the BVW protocol



**Figure 33 - Rear Panel Detail of Serial Port Connectors**

- CH1** - Channel 1, also referred to as COM1
- CH2** - Channel 2, also referred to as COM2
- CH3** - Channel 3, also referred to as COM3
- CH4** - Channel 3, also referred to as COM4

With VDCP, each port can also respond to channel ID numbers that are equal to, or multiples of, its base number. For example, channel 1 will also respond to 5, 9, 13, etc. This can be helpful when an automation system needs to control a number of servers at once

The server's multiple serial ports allow simultaneous connection of an automation controller and a desktop editing controller. For example, one could attach an edit controller to Channel 1 for record, playout, and editing; while an automation controller on Channel 3 manages play-to-air operations. Alternatively, a single controller could control the operation of all server channels. A single VDCP controller will commonly control multiple server channels.

It is also possible for a single VDCP controller to control multiple server channels.

## Controller Priority

Only one serial controller can control a given video channel at a time. In general, the first controller to gain control of a video channel will have exclusive command. This prevents conflicting instructions that would cause unexpected behavior. The only exception is that the graphic user interface can immediately take control of a channel by deselecting Serial Control in that channel's dialog window.

External controllers are prohibited from taking control away from the GUI. The **SERIAL CONTROL** mode must be checked in the channel dialog window before a remote control device can communicate with that channel.

## Configuring the Automation Interface

### Setting the automation protocol for a video channel

Each video channel can be configured independently for VDCP or BVW protocol.

To map a protocol to a channel, Click **EDIT->CONFIGURE->SERIAL PORTS** from the main pull-down menu. The screen of in **Figure 34** is displayed. Use the **PORT** pulldown to select COM1, 2, 3 or 4; these map to Video channels 1, 2, 3 and 4.

- Select VDCP to map the port to VDCP protocol
- Select BVW to map the port to BVW and ODETICS protocols

Note that the ODETICS protocol is layered with the BVW protocol, and that it supports clip names of up to **eight characters only**. Clips with longer names will not be displayed by an Odetics controller and will not be accessible. This includes the demo clips shipped with the server; see the section on page 57 to rename the clips to allow their use for testing.

VDCP operation can allow control of a channel by ID number from a different numbered serial port, while BVW and Odetics protocol control only the channel number corresponding to the number of the serial port in use. When using both protocols, take care to not allow a VDCP controller to address a channel that is controlled by BVW/Odetics on another serial port.

If necessary turn on "Assigned Serial Ports" in VDCP Options – this will force VDCP to control the channel corresponding to the serial port it is connected to *regardless* of the channel ID in the control messages.

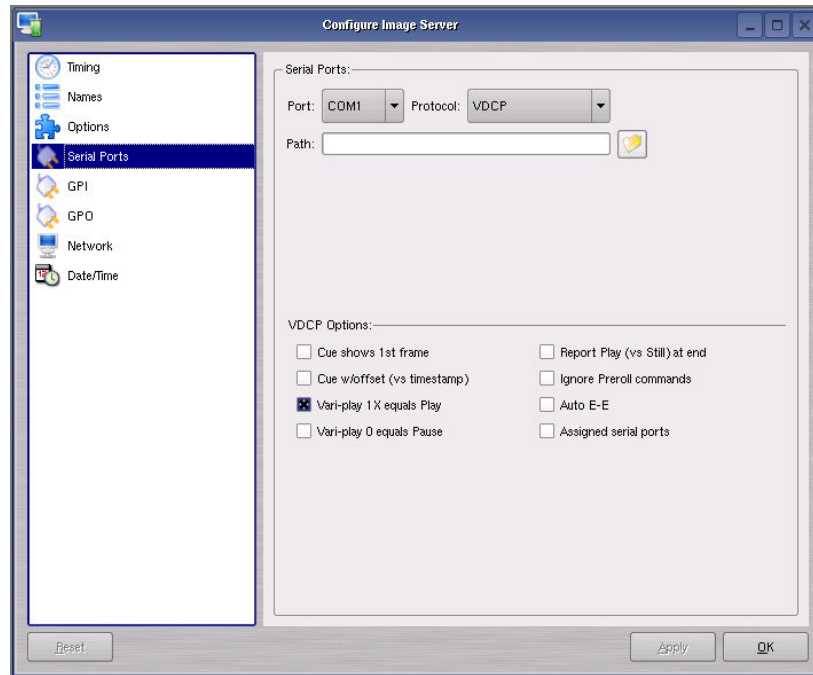


Figure 34 - Serial Port Configuration Screen

### Setting the Automation Source Directory

By default, automation equipment will access the Home or Root directory as a source of clips. The directory accessed by automation equipment can be set for each port as follows.

Select the port to be used (COM1, COM2, COM3 or COM4).

Click on the **FOLDER** icon in the **PATH** field of the Serial Port Configuration Screen. Navigate to the folder to be accessed by automation equipment.

It is recommended that for most applications only the root directory be used, and the automation system be relied on for file management rather than the server. Automation can only see the clips that are in the assigned Automation Source Directory. There are two classes of applications for folders in conjunction with serial control:

### Limiting the number of clips accessible to automation or remote controllers.

- Some controllers have limited capacity for clip display and selection. Using a folder to present only the currently needed clips can streamline operation.
- Content can be prevented from being aired but still be readily accessible. Content can be ingested at any time and made available to air by moving it into the Automation Source Directory.
- “Archived” material can be held in organized folders, then copied into the Automation Source Directory as needed to air. The copies can then be deleted after airing without affecting the archived copy.
- Content for different purposes can be grouped in folders, and selected by changing the Automation Source Directory.

### **Segregating material for different broadcast channels**

- Content can be placed in a folder for each channel, and played out by separate automation systems or controllers. Each channel can run completely independently – there can be duplicate file names with different content, and the opportunity for airing content on the wrong channel is greatly reduced.
- Content that is common to both channels can be copied into both directories. When this is done in the GUI (as opposed to FTP transfer) the copies reference the same data so they are available immediately and take no additional disk space.

### **Other Automation Options**

As illustrated in **Figure 34**, a number of check boxes are provided that control how the server will respond to certain VDCP commands. Once set, these options remain selected when the server is turned off, and until changed by the user.

**NOTE:** The following options will apply to all four video channels. They cannot be individually configured for each video channel. Except where noted, they apply only to VDCP operation.

#### **Cue Shows 1st Frame**

Upon receiving a Cue With Data or a Play Cue command, the server will cue the clip then jog to and display the first frame of video. (This also applies to Odetics protocol.)

#### **Cue with Offset (vs. Timestamp)**

When checked, the time code for the clip becomes “zero-based” with reference to the head point. To move to the head point of the clip, the automation controller would send a time code value of 00:00:00:00, regardless of the clip’s original time stamp. When unchecked, the server will calculate time code position based upon the time stamp from the first frame of the unedited clip. Note that this only affects the operation of the serial port, it does not change the way the server displays time code in the GUI.

#### **Variplay 1X Equals Play**

The server will interpret a Variplay 1x command as a Play command. (This also applies to Odetics protocol.)

#### **Variplay 0 Equals Pause**

The server will interpret a Variplay 0x command as a Pause command. (This also applies to Odetics protocol.)

#### **Report Play (vs Still) At End**

When the end of a clip is reached, the server will report Play to the automation controller, instead of Still.

### Ignore Preroll Commands

A minimum 4-frame pre-roll is required to allow the server time to respond to serial commands. See the documentation for your controller or automation to find out how to set the preroll value. Due to various ways preroll commands are implemented in different systems, it may be sufficient to check only this box. A setting of 4 frames in the automation controller will then work correctly.

This option is very seldom used; it allows preroll commands to be ignored and assumes that the operational preroll is 4 frames. Do not check this unless you experience problems with frame accuracy on recordings and playback transitions. Start with a setting of 4 frames on the automation system and adjust until you achieve proper timing.

### Auto E-E

Toggles Auto E-E mode (input monitor) on/off.

### Assigned Serial Ports

VDCP protocol provides for altering the mapping of Serial Port to Video Channel via control commands. Checking this option will **lock** the Serial Port to Video Channel ordering.

- When checked, any command received on a particular serial port will be used to control the like numbered video channel. This means that automation systems that use fixed or limited VDCP ID numbers can use any output to control any channel of the server.
- With this option checked, there is no requirement for a Port Open command to allow the automation to control the channel. With some systems, this can negate the requirement to restart the automation system when bringing the server online.
- Do not check this option when using controllers that communicate with all channels over a single serial port.

### Communication Port Parameters

The serial data transfer parameters for the server are fixed and cannot be changed. These characteristics are common to all automation controllers:

Baud Rate	38.4 K Baud
Start Bits	1
Data Bits	8
Parity	Odd
Stop Bits	1

## Tested Automation Controllers

The server has been tested by 360 Systems and the manufacturers of equipment listed below, and found to operate correctly. This list is not comprehensive, and the inclusion or absence of a product does not indicate a preference for any make or model. Operational variations do exist between makes and models.

Manufacturer	Controller	Protocol	Notes
HARRIS AUTOMATION	ADC-100	VDCP	ALL HARRIS CONTROLLERS SAME
SUNDANCE	FAST BREAK	VDCP	
NVERZION	EMC-NT	VDCP	
CRISPIN CORP.	SYSTEM 2000	VDCP	
FLORICAL	AIR BOSS	VDCP	
VCI SOLUTIONS (DTG)	AIRO	VDCP	
HARDATA	HDX VIDEO	ODETICS	
IBIS	ITA	VDCP	
PEBBLE BEACH SYSTEMS	ANEMONE	VDCP	
PROBEL	MORPHEUS	VDCP	
PHAROS	PLAYTIME	VDCP	
AVECO	ASTRA	VDCP	

## Tested Remote Control Panels and Switchers

360 Systems servers have been tested by 360 Systems as well as manufacturers of remote control devices and video switchers listed below, and found to operate correctly.

Manufacturer	Controller	Protocol	Notes
ROSS VIDEO	SYNERGY® SWITCHERS	VDCP	
ECHOLAB	OPERA SWITCHERS	VDCP	
DNF CONTROLS	4000-CL	VDCP	ALSO USED WITH DNF SHOT BOX
DNF CONTROLS	300-SSM	P2	BVW-75, ALSO ODETICS PROTOCOL
ASH VALE	SM-2	P2	SLOW MOTION CONTROLLER
BUF	VTC-4000	P2	BVW-75, ALSO ODETICS PROTOCOL
BUF	SPOT	VDCP	ALSO ODETICS PROTOCOL
LANCE DESIGNS	TDC-100	ODETICS	USE INT MODE
HI-TECH SYSTEMS	ACTIV CART BOX	VDCP	ALL VDCP PRODUCTS SAME

# Remote Workstation Interface

The Remote Workstation Interface is a software application that provides control of the server from PC workstations located within a facility. A remote workstation can access one or more video channels of the server to perform ingest, playback, trimming, playlisting, traffic operations or monitoring of server activities.

Applications include—

- Control of a server located in a machine room
- Ingest station for loading commercials and other content from tape
- Edit station for trimming content
- Building, editing and running playlists
- Remote control of a server located at a transmitter site (“evergreen” backup)
- Access to file content and operations by engineering or management
- Control of more than one server from a single workstation
- On a wireless network, a server can be controlled by a secure Wi-Fi enabled laptop computer
- Remote control in a conference room, or during auditorium presentations
- Servers may be securely controlled from a remote location, even across public Internet connections, with inexpensive VPN (Virtual Private Network) technology.

A single server may be controlled from more than one different location on the network. See **Figure 35**.

Similarly, a single computer can run multiple Remote Workstations to control multiple servers.

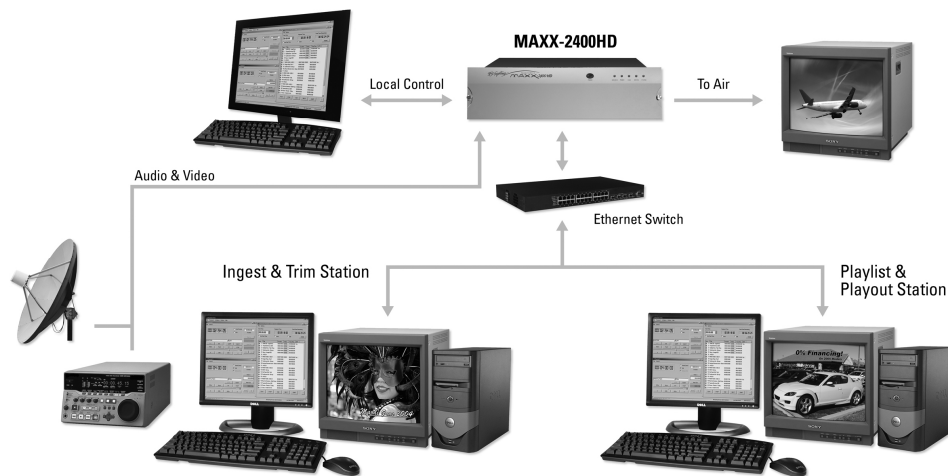
Remote Workstation software provides the same functionality as the local GUI with the following exceptions: It cannot access the server’s network configuration screen, shutdown the server, access the RAID status display, or display the server’s time-of-day clock.

As of this writing, the current version of Remote Workstation is 3.03.08, this is required to work with server software version 1.03.515.

## System Requirements

- PC with Windows XP, Vista or Windows 7 installed. Other operating systems have not been tested and may not be supported.
- 10 MB free space on the computer hard disk, plus 128 MB RAM.





**Figure 35 - Remote Workstation Deployments**

## About the Remote Workstation Interface

The Remote Workstation Interface consists of a CD-ROM carrying the Remote Workstation application for Windows XP, Vista or Windows 7 computers. It self-installs using the normal Windows prompts. It is possible to install the Remote Workstation software on a number of PCs; any of them can then control one or more channels of one or more servers.

## Operations

Up to four Remote Workstations can simultaneously view the channel activity of a single server. Only one Remote Workstation at a time can take control of a particular video channel. Control of the server video channel is not automatically granted to a Remote Workstation just by attempting to use the GUI; control must be actively taken, using the TAKE CONTROL option described below. This allows remote monitoring of server channel activity while greatly reducing the likelihood that a remote user will interfere with operations initiated by another. All Workstations, including the server's local GUI, have equal priority and any can take control of a video channel at any time. Control is granted for server channels individually, and not automatically for all four; therefore, four Remote Workstations can each control a separate video channel. Each Remote Workstation can display or close transport windows without affecting other Workstations or the Local GUI.

The IP address of a Remote Workstation currently controlling a channel appears in the status bar on the bottom-left of the Playlist or Channel window.

A menu labeled Options appears at the upper-left of each server channel window. Clicking this menu presents a drop-down menu with a TAKE CONTROL option. Select this then click Yes in the confirmation dialog to give control of the video channel to your workstation.

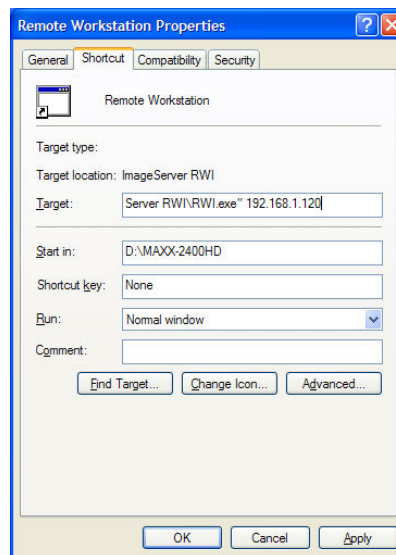
## Installation

To install Remote Workstation software from CD-ROM insert the CD-ROM into the PC.

- The auto-run capability of Windows will start the Remote Workstation setup program. If it does not, select the Run... option of the taskbar Start Menu and type: D:\setup.exe. If necessary, replace D:\ with the drive letter of your CD-ROM.
- You will be prompted to enter the IP address of the server you wish to control. If you know the address, enter it here. This information can also be entered after installation.
- Read the terms under which this software is licensed to you. If you agree, installation will continue. If you do not agree, installation will stop. Follow the prompts to finish installation.
- By default, the Remote Workstation software installs all required files into the "C:\Program Files\ Image Server RWI" folder. However, during the installation process an alternate directory may be specified. If a previous version of Remote Workstation is already installed on the Host computer, use this feature to install the new version in a uniquely named folder, for example C:\Program Files\MAXX2400.

## After Installation

A 360 Systems Remote Workstation icon will appear on your desktop. Double click the icon to open a remote session on the server. To change the target server you wish to access, right click on the Remote Workstation icon. Select "Properties" from the drop-down menu. In the "Target" text box, change the IP address listed in the box to the IP address of the server and select "OK".



**Figure 36 – Remote Workstation Properties Page**

Because multiple simultaneous sessions of Remote Workstation may be started from a single Remote Workstation, it is possible to make copies of the Remote Workstation icon and change the IP address of each to allow one-click access to any number of MAXX-2400HD servers. Simply right click on the Remote Workstation icon and select Copy from the pop-up menu. Next, right click anywhere on the desktop and select Paste. Finally, follow the instructions above to edit the IP address to match the second server.

## Hard Disk Management

MAXX-2400HD employs an advanced Serial-ATA controller that manages twelve high-capacity hard disks operating in a RAID-6 configuration. This design increases system performance, and by storing parity data, can survive the loss of up to two drives in the array without data loss.

The Image Server brings a high level of reliability to Serial-ATA RAID through a new, switched architecture that exceeds the reliability of SCSI shared-bus storage systems. The earlier shared-bus architecture of SCSI had inherent performance limitations due to arbitration latency, since only one drive may use the bus at a time. Further, a single drive failure could bring the entire storage system down.

By contrast, the Image Server uses a non-blocking switched architecture to isolate the drives from one another. Any drive failure makes that drive unavailable and the rest of the storage system remains undisturbed. In addition, the Image Server uses Advanced Data Protection features, where all drive commands are checked to ensure that no command corruption has taken place over the entire data path.

Some of the MAXX-2400HD RAID-6 implementation features and benefits include:

- Non-blocking switch technology with RAID-6 parity
- On-board processor minimizes host CPU overhead
- Easy-to-configure arrays
- Dynamic sector repair for robust data protection
- Accelerated RAID-6 writes
- Easy, hot-swappable drive replacement from front panel

## About RAID 6

A RAID 6 configuration features the data striping of RAID 0, combined with the parity benefits of RAID 4. RAID-6 is similar to RAID-5 in that parity information is distributed across all drives rather than being concentrated on a single disk. This avoids throughput loss due to contention for the parity drive. RAID-6 uses two parity stripes, and RAID-5 uses one. RAID-5 can tolerate the loss of one drive whereas RAID-6 can tolerate the loss of two drives due to the extra parity stripe. Spare drives can be used to rebuild an array after a drive is replaced.

RAID-6 capacity equals the size of drive times (number of drives -2). In addition, the array's storage efficiency increases with the number of disks; from 75 % for 8 drives to 83% for 12 drives: storage efficiency = (number of drives -2) / (number of drives).

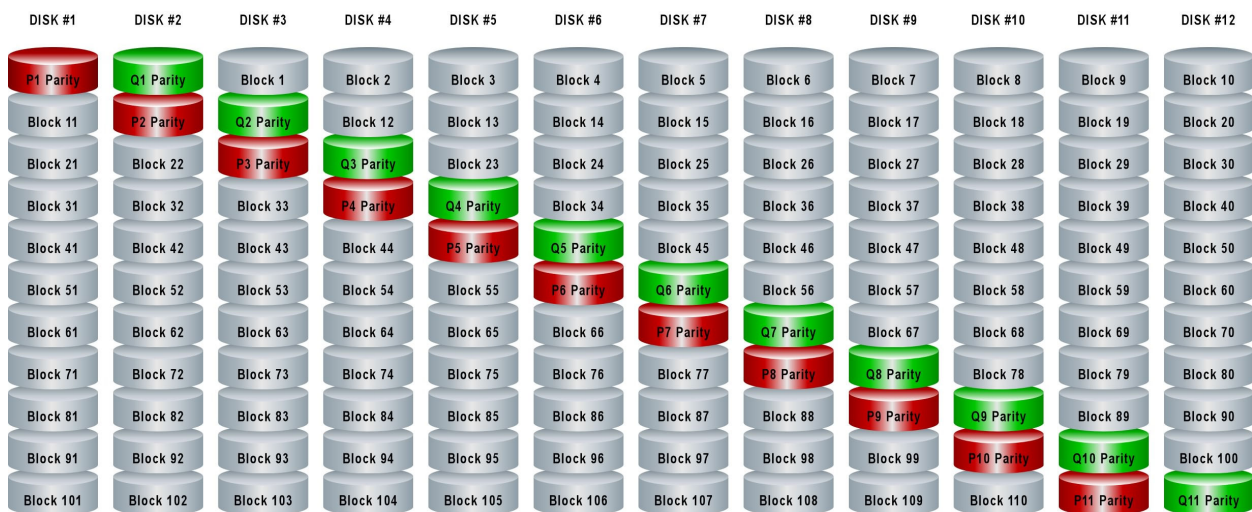


Figure 37 - RAID 6 Array Schematic

## Improved Write Performance

The Image Server uses new designs to improve RAID-6 write performance for both large sequential and small random transactions. This advanced block caching firmware delivers extremely high performance for RAID-6 write operations.

## Managing Disk Arrays

The Image Server's Disk Array Configuration Utility provides tools for monitoring and managing the disk array. Monitoring and troubleshooting programs automatically check the array, report problems and provide access to RAID status information and service options.

If up to two drive faults should occur, it should not cause data loss; but remember that the drive array is degraded and no longer has fault tolerance. Hence, another disk failure will cause a complete loss of data and system failure. After a drive failure it is strongly recommended that at the earliest time diagnostics be performed.

### Error Notification and Repair

The server will notify users in the event of a fault by flashing the front panel **DRIVES** light. A failure condition will also be indicated in the Image Server GUI in the status bar, on the bottom of the screen and highlighted in yellow ( Figure 38 ). A GPIO Output can be programmed to activate upon a RAID or system fault. This can be used to activate a warning lamp or alarm. Refer to Page 65 for more information on programming GPIO events. A drive fault can be triggered by a variety of conditions. The first step in response to an error warning is to open the RAID **CHECK STATUS** window from the On-Screen Start Menu. Click **Start > RAID Status** to launch the RAID Array Configuration Utility.



**Figure 38 - GUI Drive Fault Indication**

The **RAID Maintenance** window (Figure 41) displays the current status of the RAID controller and all disks connected to the RAID system. On inspection, you will find the array in one of the following states:

- **OK**, indicated by "OK" for Array Unit 0 and all Ports (drives);
- **Initializing**, indicated by "Initializing" on the Array Unit 0 status line;
- **Degraded**, indicated by "Degraded" on the Array Unit 0 status line;
- **Verifying**, indicated by "Verifying x%" on the Array Unit 0 status line.
- **Rebuilding**, indicated by "Rebuilding x%" on the Array Unit 0 status line.

“Verifying” is the process by which the array controller corrects data parity errors that may have occurred because of power loss, incorrect shutdown or some other data error. Upon detection of a parity error, the controller will automatically start the rebuilding process as a background task. This task should not interfere with Image Server’s ability to record or play clips.

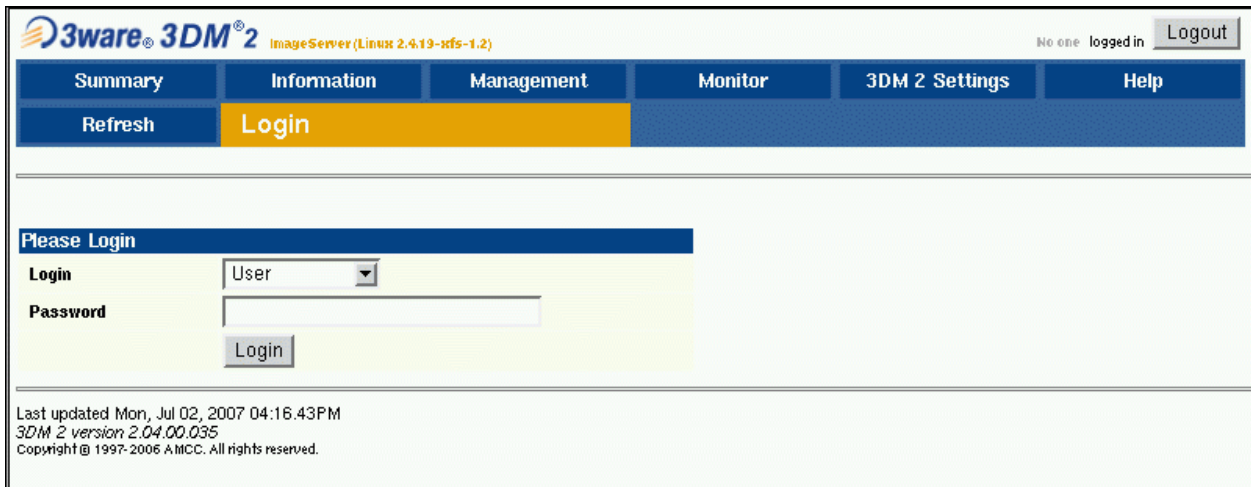
The term “degraded” refers to the state of the Array data, not necessarily the hardware or disk drives themselves. It indicates that the parity information that protects the data is not up to date.

Parity errors may occur if the server loses power, or is improperly shut off. No data will be lost, but the parity re-initialization process may take several hours. NEVER disconnect AC power to shutdown the server. Shutdown the system only by momentarily pressing the front panel power button or selecting **Start > Shutdown > Shutdown** from the graphic user interface.

Note that in some cases the power may not automatically shut off after a Shutdown is executed. When the front panel LED indicators start flashing in response to the Shutdown command, the file system has been successfully closed and it is safe to force the power off by holding the **Reset** switch in for four seconds.

A degraded array with a drive listed as “Not In Service” or “Inaccessible” is usually indicative of a permanent drive error, typically a single disk or cable failure, but redundant data will allow normal operations to continue. You may first try to rebuild the array with the existing drive still installed. If the array continues to indicate a failed drive, replace the drive and then rebuild the array. A hard disk array must be repaired using exactly the same drive model and capacity as other drives in the array. Because specific drive models become unavailable as time goes on, 360 Systems recommends that maintenance spares be purchased at the same time as the Image Server.

## Log-In to the RAID Utilities



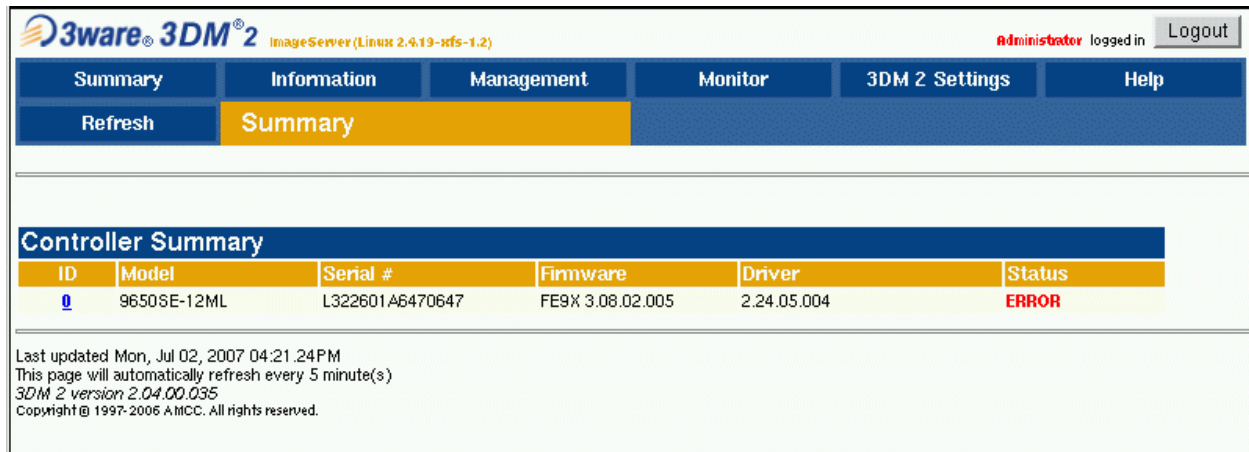
**Figure 39 - RAID Utilities Login Screen**

To log in to the RAID utilities, perform the following steps. The above screen will appear.

- Open the RAID utilities by selecting **START > RAID STATUS**
- In the **Login** window, enter ADMINISTRATOR.
- In the **Password** window, make no entry; leave it blank. In the event this does not work, use the password “3ware”.
- Click the **Login** button to enter the Login Utilities.



## Determining the Condition of the RAID Array



3ware® 3DM® 2 ImageServer (Linux 2.4.19-rfs-1.2) Administrator logged in Logout

Summary Information Management Monitor 3DM 2 Settings Help

Refresh Summary

**Controller Summary**

ID	Model	Serial #	Firmware	Driver	Status
<a href="#">0</a>	9650SE-12ML	L322601A6470647	FE9X 3.08.02.005	2.24.05.004	<b>ERROR</b>

Last updated Mon, Jul 02, 2007 04:21:24PM  
 This page will automatically refresh every 5 minute(s)  
 3DM 2 version 2.04.00.035  
 Copyright © 1997-2006 A.M.C.C. All rights reserved.

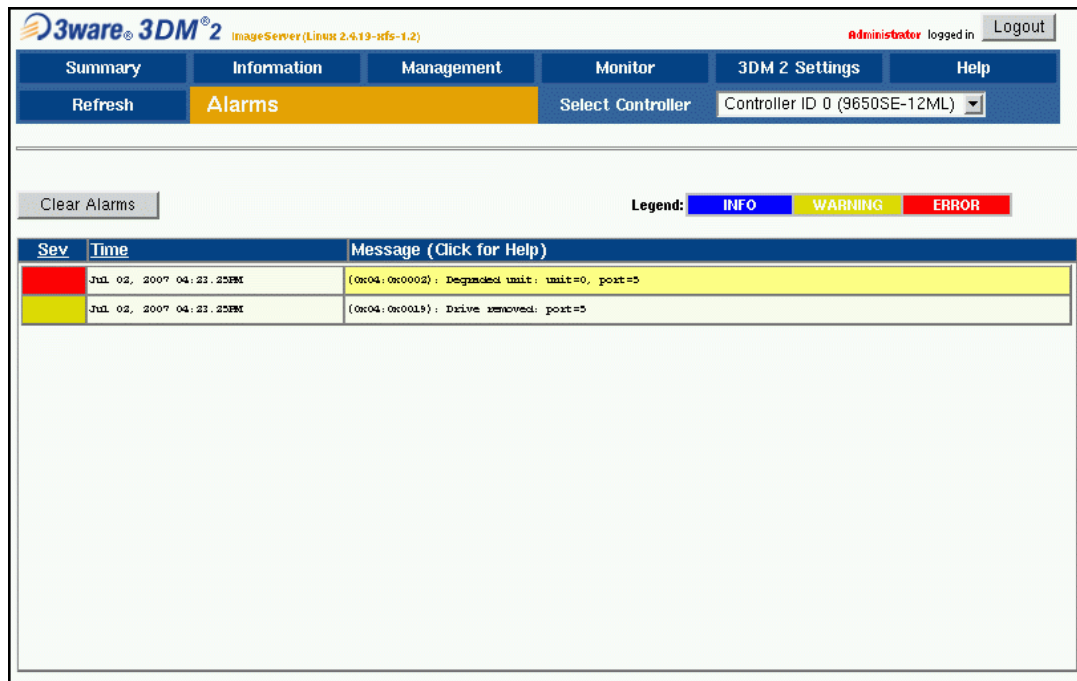
**Figure 40 - RAID Array Condition Screen**

To replace a failed drive in the RAID control utility, perform the following steps. The above screen should appear.

- Login as ADMINISTRATOR.
- Note the ERROR STATUS on this Summary Screen.
- If an error condition is indicated continue to next page.



## Displaying the Alarm Log of the Raid Array



**Figure 41 - RAID Alarm Log Screen**

The RAID controller keeps track of any condition that would adversely affect its reliability. In the event that an error should occur, the alarm log will be helpful in diagnosing the problem.

The above screen will appear.

- Select **MONITOR > ALARMS** from the screen.
- Make note of any error conditions reported, and what Port numbers they refer to.

Some examples of error messages are:

**Drive Timeout Error** – The drive failed to respond to a command from the controller within the allotted time. This is sometimes a benign condition, but often indicates a hardware problem with the drive.

**Drive Error** – The drive reported a data error. A rare isolated occurrence may be acceptable, but probably indicates a drive failure.

**Drive SMART Threshold Exceeded** – The drive's self diagnostic program is reporting an impending drive failure. The drive should be replaced.

**Remapping Bad Sector** – This is a normal function of a hard drive's self maintenance. As a drive ages it is normal for sectors to fail, these are reassigned to a different part of the drive. Several may occur within a very short period (seconds to a few minutes.). Multiple such errors within a few days may indicate an impending drive failure.

**Unclean Shutdown Detected** – Power was lost without an orderly shutdown sequence, and the parity information was not updated.

## Checking Status of the Drives

3ware 3DM<sup>®</sup>2 ImageServer (Linux 2.4.19-rfs-1.2) Administrator logged in Logout

Summary Information Management Monitor 3DM 2 Settings Help

Refresh Maintenance Select Controller Controller ID 0 (9650SE-12ML)

Rescan Controller (This will scan all ports for newly inserted drives/units)

### Unit Maintenance (Controller ID 0)

Unit 0	12 drives	RAID 6	4.55 TB	DEGRADED	
Port 11		HDS725050KLA360	465.76 GB	OK	
Port 10		HDS725050KLA360	465.76 GB	OK	
Port 9		HDS725050KLA360	465.76 GB	OK	
Port 8		HDS725050KLA360	465.76 GB	OK	
Port 7		HDS725050KLA360	465.76 GB	OK	
Port 6		HDS725050KLA360	465.76 GB	OK	
Port 5		HDS725050KLA360	465.76 GB	DEGRADED	<a href="#">[Remove Drive]</a>
Port 4		HDS725050KLA360	465.76 GB	OK	
Port 3		HDS725050KLA360	465.76 GB	OK	
Port 2		HDS725050KLA360	465.76 GB	OK	
Port 1		HDS725050KLA360	465.76 GB	OK	
Port 0		HDS725050KLA360	465.76 GB	DEGRADED	<a href="#">[Remove Drive]</a>

Verify Unit Rebuild Unit Migrate Unit Remove Unit Delete Unit

\*Before removing or deleting a unit, make sure there is no I/O on the unit and unmount it

### Available Drives (Controller ID 0)

NO DRIVES

[Select All Drives](#)

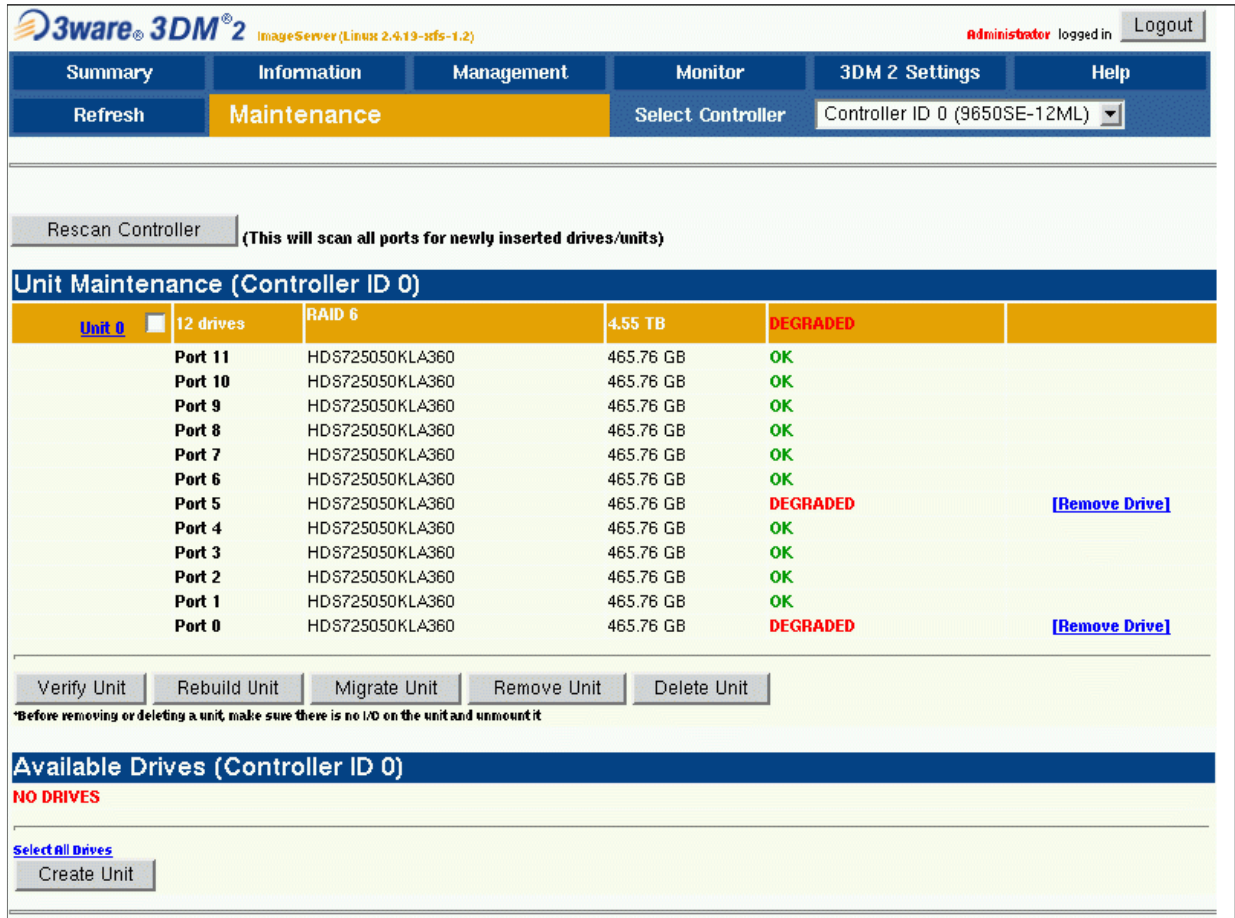
Create Unit

Figure 42 - RAID Array Maintenance Screen

To check the status of the RAID drive array, perform the following steps. The above screen should appear.

- Select **MANAGEMENT > MAINTENANCE**.
- Note the status of each drive in the array.

## Removing the Degraded Drive from the RAID Unit



The screenshot shows the 3ware 3DM2 web interface. At the top, there are navigation tabs: Summary, Information, Management, Monitor, 3DM 2 Settings, and Help. Below these is a 'Maintenance' tab and a 'Select Controller' dropdown menu set to 'Controller ID 0 (9650SE-12ML)'. A 'Rescan Controller' button is visible with the note '(This will scan all ports for newly inserted drives/units)'. The main section is titled 'Unit Maintenance (Controller ID 0)' and contains a table of drives. Below the table are buttons for 'Verify Unit', 'Rebuild Unit', 'Migrate Unit', 'Remove Unit', and 'Delete Unit'. A warning message states: '\*Before removing or deleting a unit, make sure there is no I/O on the unit and unmount it'. Below this is the 'Available Drives (Controller ID 0)' section, which currently shows 'NO DRIVES' and a 'Create Unit' button.

Unit 0	12 drives	RAID 6	4.55 TB	DEGRADED	
Port 11		HDS725050KLA360	465.76 GB	OK	
Port 10		HDS725050KLA360	465.76 GB	OK	
Port 9		HDS725050KLA360	465.76 GB	OK	
Port 8		HDS725050KLA360	465.76 GB	OK	
Port 7		HDS725050KLA360	465.76 GB	OK	
Port 6		HDS725050KLA360	465.76 GB	OK	
Port 5		HDS725050KLA360	465.76 GB	DEGRADED	<a href="#">[Remove Drive]</a>
Port 4		HDS725050KLA360	465.76 GB	OK	
Port 3		HDS725050KLA360	465.76 GB	OK	
Port 2		HDS725050KLA360	465.76 GB	OK	
Port 1		HDS725050KLA360	465.76 GB	OK	
Port 0		HDS725050KLA360	465.76 GB	DEGRADED	<a href="#">[Remove Drive]</a>

Figure 43 - Removing Failed Drive from Array

The UNIT MAINTENANCE SCREEN above will appear.

- Remove the degraded drive from the menu by clicking **Remove Drive**.
- Select the **Rescan Controller** option on the above screen to have the system recognize the drive as Available.

## Rebuilding the RAID Array

The screenshot shows the 3ware 3DM 2 web interface. At the top, there are navigation tabs: Summary, Information, Management, Monitor, 3DM 2 Settings, and Help. The 'Maintenance' tab is active. A message states: "Rescan found the following unit(s): [none] : Found the following drives(s): [none]". Below this, there is a 'Rescan Controller' button and a note: "(This will scan all ports for newly inserted drives/units)".

A modal dialog titled "Unit" is open, displaying the text: "Select one or more drives to use to rebuild and click OK". The dialog contains a table with the following data:

Port	Model	Capacity	Status
<input type="checkbox"/> Port 1	HD S725050KLA360	465.76 GB	OK

Buttons for 'OK' and 'Cancel' are at the bottom of the dialog. To the right of the dialog, a vertical list of actions is visible: [Stop Verify], [Remove Drive], [Remove Drive], [Remove Drive], [Remove Drive], [Remove Drive], [Remove Drive], [Remove Drive], [Remove Drive], [Remove Drive].

Below the dialog, a table lists the units in the RAID array:

Port	Model	Capacity	Status	Action
Port 5	HD S725050KLA360	465.76 GB	OK	[Remove Drive]
Port 4	HD S725050KLA360	465.76 GB	OK	[Remove Drive]
Port 3	HD S725050KLA360	465.76 GB	OK	[Remove Drive]
Port 2	HD S725050KLA360	465.76 GB	OK	[Remove Drive]
--	--	--	NOT PRESENT	
Port 0	HD S725050KLA360	465.76 GB	OK	[Remove Drive]

At the bottom of the unit list, there are buttons: [Verify Unit], [Rebuild Unit], [Migrate Unit], [Remove Unit], and [Delete Unit]. A note below reads: "Before removing or deleting a unit, make sure there is no I/O on the unit and unmount it".

Below the unit list, there is a section titled "Available Drives (Controller ID 0)" with a table:

Port	Model	Capacity	Status	Action
<input type="checkbox"/> Port 1	HD S725050KLA360	465.76 GB	OK	[Remove Drive]

At the bottom left, there are buttons: [Select All Drives] and [Create Lnit].

Figure 44 - Selecting a drive to rebuild

- Select **Rebuild Unit**. The REBUILD SCREEN above will appear.
- Select the available drive by clicking the check box.
- Press **OK**. The RAID array will begin rebuilding with the new drive. This process may take a long time, but the Image Server can still be used.
- When complete, OK will be shown in the status for all ports on the MAINTENANCE menu.

## Replacing Hard Drives

Maxx 2400HD Hard Drives are hot-swappable, meaning they can be replaced “on-the-fly” without loss of data or interruption of server operation.

To replace a drive:

- A. Loosen the knurled screws fastening the front panel. Pull forward and down to expose the drive.
- B. Remove the drive by pulling on the blue lever to unlatch the drive. Refer to Figure 45. Remove the drive from the tray and replace it with the replacement drive.
- C. With the blue latch still extended, gently slide the tray into the bay until you feel it “seat”. Press on the latch to lock the drive into place. Return the panel to its normal position.



**Figure 45 - Front Panel Opened – Disk Unlatched**



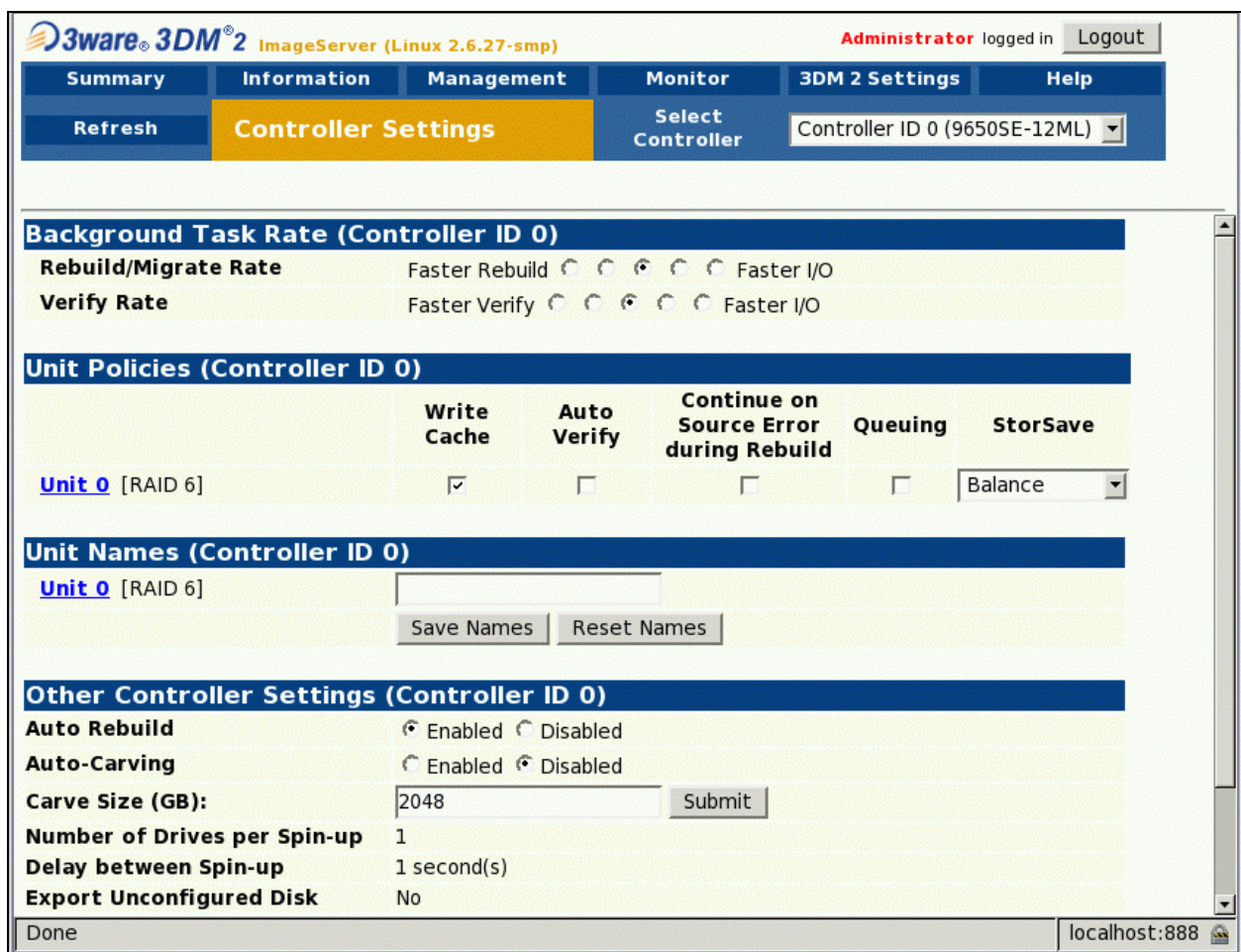
## RAID Controller Settings

The server RAID controller is configured at the factory. The following is provided only to verify these settings and to recreate them if necessary in the event the system is rebuilt. (The software installation should configure these correctly, but they should be checked to verify accuracy.)

Do not use the Scheduled Events, Email Announcement or Remote Login features.

These settings are critical to proper operation of the system. The only parameter that can be changed is “Continue on Source Error during Rebuild” which when turned on relaxes the condition that any error found in the source material will stop the rebuild process.

It is particularly critical that the Write Cache be checked.



**3ware 3DM<sup>2</sup> ImageServer (Linux 2.6.27-smp)** Administrator logged in Logout

Summary Information Management Monitor 3DM 2 Settings Help

Refresh **Controller Settings** Select Controller Controller ID 0 (9650SE-12ML)

---

**Background Task Rate (Controller ID 0)**

Rebuild/Migrate Rate Faster Rebuild      Faster I/O

Verify Rate Faster Verify      Faster I/O

---

**Unit Policies (Controller ID 0)**

	Write Cache	Auto Verify	Continue on Source Error during Rebuild	Queuing	StorSave
<a href="#">Unit 0</a> [RAID 6]	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Balance

---

**Unit Names (Controller ID 0)**

[Unit 0](#) [RAID 6]

Save Names Reset Names

---

**Other Controller Settings (Controller ID 0)**

Auto Rebuild  Enabled  Disabled

Auto-Carving  Enabled  Disabled

Carve Size (GB):  Submit

Number of Drives per Spin-up 1

Delay between Spin-up 1 second(s)

Export Unconfigured Disk No

Done localhost:888

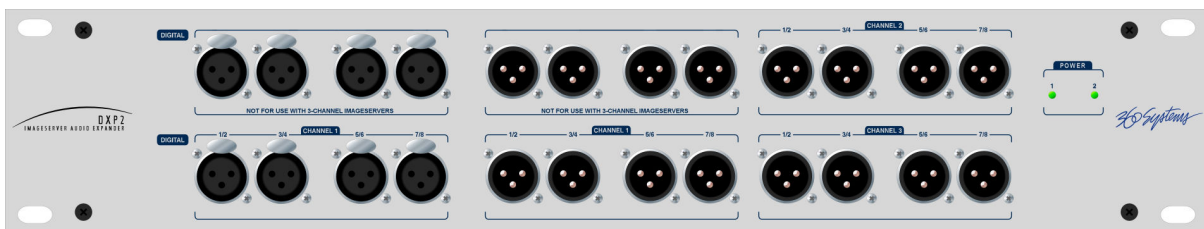
## Multi-Channel Audio

### Audio Input/Output Modules

In addition to embedded audio, provided as a standard feature on the MAXX-2400HD, an analog audio and a digital audio I/O module are available as optional accessories. Each provides for a total of eight audio channels on XLR-3 connectors, for each video input or output.

### DXP-2 Digital Audio Module

The DXP-2 Digital Audio Module provides 8 audio channels in AES/EBU format, for each video input or output. It is housed in a 2-RU rack-mount enclosure (3½" – 88mm height), which connects to the server chassis with a 1-meter, 68-pin cable included with the DXP-2. The DXP-2 is self-powered from AC mains, and contains all audio circuitry. (It is not a connector 'break-out box'.)



**DXP-2 Digital Audio I/O Module**

Audio outputs from the DXP-2 duplicate the embedded digital audio contained in the video. They are at a fixed 48 KHz sample rate, and are normally referenced to video genlock. Digital audio input signals should also be at 48 kHz, and be derived from video genlock.

When used in combination with DXP-2, the MAXX-2400HD can record, store, and play compressed or specially-encoded digital audio such as Dolby®-E, AC-3, or DTS®, using 360 Systems' Bit-for-Bit® technology. The output data stream remains identical to the input data.

The DXP-2 contains dual redundant power supplies operated from two separate AC mains connections. Either power input can be lost, with no effect on audio throughput. Two blue LEDs indicate operation of the power supplies. There are no other controls or adjustments on the DXP-2.

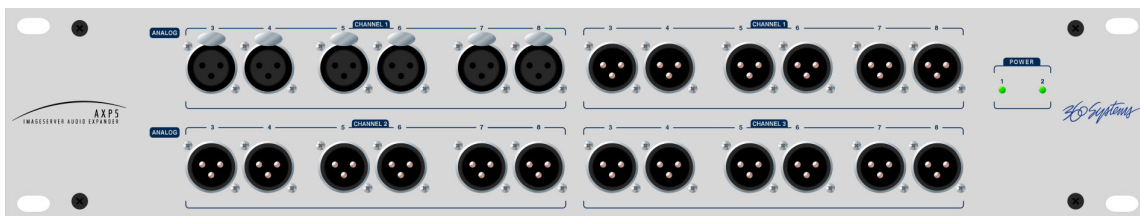
## DXP-2 Technical Specifications

<b>Digital Audio Module</b>	
Audio channels	8 per video channel (3 outputs x 8, 1 input x 8)
Audio format	AES/EBU
Word Size	24-bit
Sampling Frequency	48 kHz
Audio connector	XLR-3, gold plated
Data connection to server	68-pin x 1-meter cable connects DXP-2 to MAXX-2400HD
Audio synchronization	Derived from video genlock
Dolby® compatibility	Bit-for-Bit® reproduction of compressed audio data
Dimensions	3½" x 19" x 5¼" [90 x 483 x 133mm] HWD.
Weight	8 lb [3.6 kg] net
Power	100 – 240 volts, 50/60 Hz, 50 watts
Power supplies	Modular, dual, redundant with separate IEC AC mains connectors
Cooling	Convection
Operating temperature	40° F to 85° F [4°C to 29°C]
Approvals	RoHS compliant
Country of manufacture	U.S.A.

## AXP-3 Analog Audio Module

The AXP-3 Analog Audio Module provides 4 channels of balanced, +4 dBu analog audio on XLR connectors, for each video input or output. The AXP-4 Analog Audio Module may also be used in conjunction with the AXP-3, providing 4 additional audio channels—normally channels 4 through 8. Audio outputs from the AXP-3 and AXP-4 exactly duplicate embedded audio contained within a video stream.

The AXP modules are housed in a 2-RU rack-mount enclosures (3½" – 88mm high), which connect to the main server chassis with a 1-meter, 68-pin cable, included with the AXP. The module is self-powered from AC mains, and contains all audio circuitry. (It is not a connector 'break-out box'.)



**AXP-3 Analog Audio I/O Module**

The AXP modules contain dual redundant power supplies, operating from two separate AC mains connections. Either power input can be lost with no effect on audio throughput. Two blue LEDs indicate operation of the power supplies.

Precision internal trimmers allow input-output gain to be adjusted by  $\pm 1$  dB. There are no external controls or adjustments on the AXP modules.



## AXP3/AXP4 Technical Specifications

<b>Analog Audio Module</b>	
Audio channels	4 per video channel
Word Size	24-bit
Sampling Frequency	48 kHz
SNR	> 106 dB A-wtd. Ref to FS -1 dB
THD+N	< .01%
Input impedance	Z=10 k-ohm per leg
Output impedance	Z=50 ohm per leg
Headroom	20 dB above nominal +4 dBu operating level
Audio connector	XLR-3, gold plated
Data connection	68-pin x 1-meter cable connects AXP to MAXX-2400HD
Dimensions	3½" x 19" x 5¼" [90 x 483 x 133mm] HWD.
Weight	8 lb [3.6 kg] net
Power	100 – 240 volts, 50/60 Hz, 50 watts
Power supplies	Modular, dual, redundant with separate IEC AC mains connectors
Cooling	Convection
Operating temperature	40° F to 85° F [4°C to 29°C]
Approvals	RoHS compliant
Country of manufacture	U.S.A.

# Maintenance

## Fault Diagnostics

### Front Panel Indicators

The five LED indicators on the front panel are used to diagnose server fault conditions. The meaning of each indicator is noted in the following table. During normal operation, all five LEDs will be on.

<b>GENLOCK</b>	OFF indicates that the Genlock setting in the System menu is "Internal" FLASHING indicates that Genlock is selected in the System menu, but there is no signal, or an invalid signal, at the <b>GENLOCK</b> input connector.	Check the Genlock setting in the On-Screen System menu. Check the Genlock cable connections or signal.
<b>POWER</b>	FLASHING indicates that there is a fault in the system power supply.	Shut down the server and contact 360 Systems Customer Support for further hardware diagnosis.
<b>FANS</b>	FLASHING indicates that there is a fault of the internal chassis fan.	Check the chassis fan operation. Replace if necessary. Do not run the server without a working fan.
<b>DRIVES</b>	FLASHING indicates that there is a fault in the system RAID array.	Check the RAID array status using the utility under <b>START &gt;RAID STATUS</b> .
<b>SYSTEM</b>	FLASHING indicates that the CPU fan is running slow, or stopped; or that the CPU temperature or voltage is not within manufacturer's specification.	Shut down the server and contact 360 Systems Customer Support for further hardware diagnosis.



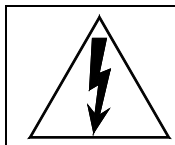
Repairs should be performed only by qualified electronics technicians.

## Gigabit Ethernet Indicators

The Gigabit Network Port card has the following indicator lights:

Label	Indication	Meaning
ACT/LNK (Left)	Green on	The port is connected to a valid link partner
	Green flashing	Data activity
	Off	No link
10=OFF 100=GREEN 1000=YELLOW (Right)	Off	10 Mb/sec
	Green	100 Mb/sec
	Yellow	1000 Mb/sec

## Access To Components



Be certain to shut down the server and disconnect the power cord before opening the unit for service.

The following sections provide instruction on disassembly and re-assembly for maintenance.

### Opening the Front Panel

The front panel is easily opened for access to the twelve disk drives, or for removing the server from an equipment rack. Using a coin or a flat-blade screwdriver, unscrew the two large panel fasteners on the left and right sides of the face panel. Pull outward and down to remove cover.

To re-install the front panel, verify that all wires are within the chassis, then place the front panel into position and tighten the front panel access screws just enough to be snug.

### Removing the Top Cover

Press down on the two latch buttons, slide the cover toward the rear of the chassis, then lift.

## General Handling Precautions

### ESD Precautions



Observe electrostatic discharge (ESD) precautions to avoid damaging static-sensitive components when handling any PC card or disk drive.

- When the case of your server is open and its internal parts are exposed, do not touch any internal part without first grounding yourself to the chassis.
- Always wear a ground strap or work on an ESD-protective mat.
- DO NOT remove components from protective packaging until you are properly grounded.
- Handle printed circuit boards by their edges or by the metal bracket.
- Don't touch any pin, contact, lead or component on the printed circuit boards.
- Keep disk drives in their anti-static package until installed in the server.

### Mechanical Concerns

- Be careful when installing I/O cards into your system. Excessive force can damage the PC boards, cables or the motherboard.
- Be sure each board is aligned with its slot in the mating connector before installing. Use care to not flex any PC boards.
- Interface cable connectors must be mated carefully. Use care to not bend any of the pins. The connectors provided are keyed to prevent upside-down insertion.
- Interface cables are fragile and must not be pinched. Ensure that their dress does not restrict airflow from fans or heat sinks within the enclosure.
- Prior to installation, keep disk drives stored in a foam-lined protective carton to protect them from physical damage.

### Installing/Removing I/O Cards

Refer to separate maintenance documents on the MAXX-2400HD. Any repair, adjustment or service operation must be performed by a qualified technician.

## Software Updates From CD-Rom

Program updates for MAXX-2400HD may be issued periodically. The operating system and application programs can be updated with the internal CD-ROM drive. The current software version may be determined by looking in the GUI **Help > About** dialog box.

To install a program update, follow these instructions. Please read completely before beginning.

1. Open the server front panel. The internal CD-ROM drive is located on the left side.
2. With power applied, press the eject button on the drive. The drawer will open a short distance. Gently pull the drawer open and insert a new CD-ROM upgrade disk, printed side up. Push the drawer closed until it latches.
3. Press the front panel power switch briefly to shutdown the Image Server.
4. Wait 5 seconds, then press the front panel switch again to boot from the CD.
5. The Installer menu provides a choice to update the server operating system, begin a new complete install, or cancel the install.
  - Choose UPDATE if you want to keep the video and audio clip files that exist on the server. Use this selection for all normal software updates.
  - Choose NEW only if you want to partition and reformat the drive array, and install the new operating system.

**IMPORTANT! Using the NEW option will irrevocably delete all video and audio files.**

For normal software upgrades, use the UPDATE option, and not NEW. The use of the NEW option is REQUIRED if the RAID Array is being created for the first time. This would usually occur the first time new disks are installed.

6. The message, "Please wait while software is being installed" will appear with an activity indicator. When installation is complete, the server will automatically reboot from its hard disk array, and will display a copyright notice while starting up. It will also release the CD drawer. Be sure to remove the CD. DO NOT leave it in the drive.
7. Replace the front panel. Tighten the two large access screws.

If a disk cannot be ejected because the system is not responding or is powered off, the CD-ROM drawer can be released by inserting a paper clip into the small hole on the front of the drive.

## Program Updates from USB Memory

Program updates for the MAXX-2400HD may be issued from time to time. The server's operating system and application programs can be updated by the user from a USB Flash Drive distributed by 360 Systems. The current software version is determined by looking in the GUI **Help > About** dialog box.

To install a program update, follow these instructions. Please read them completely before beginning.

1. Discontinue all record, play, network transfer or system-level operations.
2. With power applied, insert a 360 Systems USB Flash Drive into a USB a socket.
3. Press the front panel power switch briefly to shutdown the server.
4. Wait 5 seconds, then press the front panel power switch again to boot from the USB Flash Drive.
5. The Installer menu provides a choice to Update the server operating system, begin a new complete install, or cancel the install.
  - Choose UPDATE if you want to keep the video and audio clip files that exist on the server. Use this selection for all normal software updates.
  - Choose NEW only if you want to partition and reformat the drive array, and install the new operating system.

**IMPORTANT!** Using the NEW option will destroy all video and audio files on the server. For normal software upgrades, use the UPDATE option instead of NEW.
6. The message, "Please wait while server is being installed" will appear with an activity indicator. When installation is complete, the server will automatically reboot from its hard disk array, and will display a copyright notice while starting up.
7. **IMPORTANT!** Remove the USB Flash Drive. Never leave it plugged into the server.

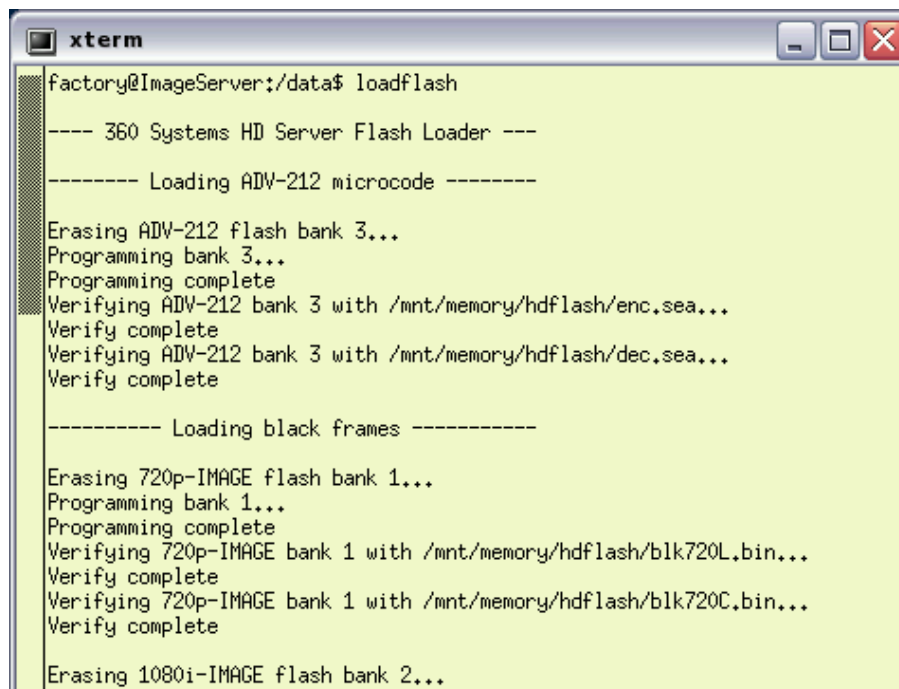
## Updating Firmware

Firmware is low-level code used by the video hardware; it is not server operating system software. If a software update is to be performed as well, install it first unless instructions that came with the software update specifically require loading a particular version of firmware. This procedure must be done from the local GUI; it cannot be done at a Remote Workstation. The following operation should only be undertaken by competent computer technician.

To update the firmware:

1. Power off the MAXX 2400HD server by selecting **Start > Shutdown > Shutdown**. Power on again, using the front panel **RESET** button, accessible through the small hole near the LEDs.
2. Once the server has finished initializing, close the GUI by clicking the 'close' button at the upper right corner of the main window.
3. Open a terminal window by holding the Shift and Control keys and pressing the F12 key on the keyboard. Stop the server application by typing:  
killall app Enter
4. Insert the flash memory stick that was supplied with the firmware. Wait several seconds for the system to recognize the flash drive.
5. In the terminal window, type: loadflash Enter

You will see messages like the following:

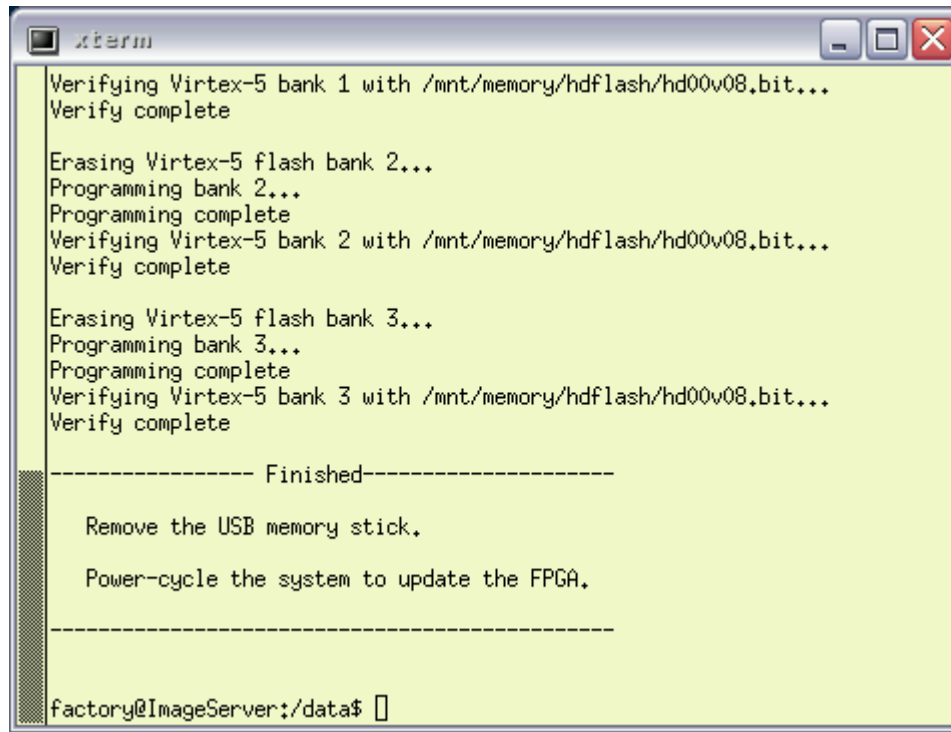


```

xterm
factory@ImageServer:/data$ loadflash
---- 360 Systems HD Server Flash Loader ----
----- Loading ADV-212 microcode -----
Erasing ADV-212 flash bank 3...
Programming bank 3...
Programming complete
Verifying ADV-212 bank 3 with /mnt/memory/hdflash/enc.sea...
Verify complete
Verifying ADV-212 bank 3 with /mnt/memory/hdflash/dec.sea...
Verify complete
----- Loading black frames -----
Erasing 720p-IMAGE flash bank 1...
Programming bank 1...
Programming complete
Verifying 720p-IMAGE bank 1 with /mnt/memory/hdflash/blk720L.bin...
Verify complete
Verifying 720p-IMAGE bank 1 with /mnt/memory/hdflash/blk720C.bin...
Verify complete
Erasing 1080i-IMAGE flash bank 2...

```

After each bank is loaded, you should see the message “Verify complete”. The procedure will continue, and finally end with the prompt and cursor:



```
xterm
Verifying Virtex-5 bank 1 with /mnt/memory/hdflash/hd00v08.bit...
Verify complete

Erasing Virtex-5 flash bank 2...
Programming bank 2...
Programming complete
Verifying Virtex-5 bank 2 with /mnt/memory/hdflash/hd00v08.bit...
Verify complete

Erasing Virtex-5 flash bank 3...
Programming bank 3...
Programming complete
Verifying Virtex-5 bank 3 with /mnt/memory/hdflash/hd00v08.bit...
Verify complete

----- Finished-----

Remove the USB memory stick.

Power-cycle the system to update the FPGA.

-----

factory@ImageServer:~/data$
```

If any of the banks indicate an error during the erase, verify, or programming phases, IMMEDIATELY repeat the operation “loadflash Enter” without doing any other operation.

If the procedure still fails, perform this entire procedure again. Should you still encounter a problem, please contact 360 Systems technical support.



## Replacing a Hard Drive

Do not remove a hard drive from the server unless the diagnostic software identifies a permanent fault. In that event, the front panel **DRIVES** LED will blink. Use the hard disk management tools to verify that a drive is at fault. The application monitors many things about the array and individual drives, and will clearly indicate whether a drive has failed.

**CAUTION: Do not install drives that were not received from 360 Systems.**

**CAUTION: All drives in the RAID array must be identical.**

Each hard drive slot is numbered 0 through 11, as are the drives. If for any reason one or more drives have been removed, they must be reinstalled in the same location, the drive number matching the numbered location. Installation in the wrong location will destroy data stored on all the drives.

1. Shutdown the server using the front panel button. After it has shut down, turn off the rear AC power switch.
2. Remove the front panel as described above.
3. Unplug the 4-conductor power connector, and the wide data connector from the drive.
4. Pull the black knob to release the drive carrier. The knob will pop out slightly; it is not removable.
5. To install a new drive, slide its mounting plate into the correct position in the drive shelf, and push the black knob in until it clicks. The drive is now secured. Reattach the power and data cables.
6. Replace the front panel and tighten the two thumb screws until they are just snug.
7. Turn on the rear panel AC switch.
8. Turn the system ON using the front panel button, and check the RAID array status.
9. Verify correct operation of the server.

## Factory Repair Policy

A video server being returned under warranty shall be sent to 360 Systems, freight prepaid, in the original or equivalent packaging. Call 360 Systems for a return authorization number *before* returning a product. Have your serial number and software version number available for reference.

Use the following address for shipping and correspondence. 360 Systems' offices are open Monday through Friday, from 8:30 AM to 5:00 PM, Pacific Time.

360 Systems  
Customer Service Dept.  
31355 Agoura Road  
Westlake Village, CA 91361

Telephone (818) 991-0360  
Fax (818) 991-1360  
E-mail [info@360systems.com](mailto:info@360systems.com)  
Website [www.360systems.com](http://www.360systems.com)

## Regulatory Certifications

### Safety

The server was tested by Underwriters Laboratories and found to comply with the following safety standards:

EN 60950, 3rd Edition, dated December 1, 2000, Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.

### Radio Interference Compliance

#### Radio Interference (USA)

**WARNING:** This equipment has been tested and found to comply with the limits for Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction's manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that changes and modifications made to the equipment without approval of the manufacturer could void the user's authority to operate this equipment.

It is suggested that the user use only shielded and grounded cables to ensure compliance with FCC Rules.

#### FCC Emission Limits

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

#### Radio Interference (Canada)

English: This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Français: Cet appareil numérique de la classe A respecte toute les exigences du Règlement sur le matériel brouilleur du Canada

#### RoHS Compliance

This product is in compliance with the Hazardous Substances in Electrical and Electronic Equipment directive (RoHS) - 2002/95/EC. The materials and substances listed in the RoHS directive, specifically lead, mercury, cadmium, hexavalent chromium, PBB and PBDE's, are not intentionally added to, or believed to be contained in this product.

#### CE Mark

Testing to be completed before shipment to the EU.

# Product Warranty

## Limited Warranty

This product is warranted to the original purchaser against defects in material and workmanship for a period of one year from the date of original purchase. This warranty covers parts and labor and is effective when the product is used without alteration for the purpose intended by 360 Systems. This warranty excludes products with modified or unauthorized software, that have been subject to misuse or neglect, that have been modified, repaired improperly or by unauthorized personnel, damaged by rough handling, abuse, improper operation, excessive temperature, lightning strike, static electricity, electrical surges or other electrical system malfunctions, improper or inadequate maintenance or care and that have been subject to use of unauthorized or non-conforming accessories or attachments. This warranty also excludes normal wear and deterioration occasioned by the use of the product.

If part of the product is defective, the entire product must be returned along with the original purchase receipt or other evidence of purchase and a description of the defect to 360 Systems, 31355 Agoura Road, Westlake Village, California 91361. Upon receipt, its condition will be verified, and if the product qualifies for warranty coverage, 360 Systems will, at its option, repair or replace the product without charge. In the case of replacement, if the replacement for a defective product is no longer available, 360 Systems will replace it with a similar product or, if not available, a product of equal value.

### **DISCLAIMER AND LIMITATION OF LIABILITY**

The liability of 360 Systems under the foregoing warranty is limited solely to the repair or replacement of defective material or workmanship and does not include any expense related to the shipment of the product to or from 360 Systems or compensation for any inconvenience or loss of use of the product while it is being repaired or replaced.

**EXCEPT AS EXPRESSLY STATED HEREIN, 360 SYSTEMS EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, OF ANY KIND WITH RESPECT TO THE PRODUCT, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

**BY PURCHASE OR USE OF THIS PRODUCT, THE OWNER/OPERATOR ASSUMES SOLE RESPONSIBILITY FOR OBTAINING LICENSES and/or PATENTS ASSOCIATED WITH ITS OWNERSHIP, BROADCASTING, RENTAL, OR ANY OTHER USE OF SAID PRODUCT. THE OWNER/OPERATOR IS SOLELY LIABLE FOR ANY BREACH OF THAT RESPONSIBILITY AND SHALL INDEMNIFY AND HOLD 360 SYSTEMS HARMLESS FROM ANY AND ALL CLAIMS THAT MAY ARISE IN REGARD TO ANY SUCH LICENSES and/or PATENTS, INCLUDING THIRD PARTY PATENT CLAIMS. THIS PROVISION SHALL TAKE PRECEDENCE OVER ANY PROVISIONS TO THE CONTRARY IN OWNER/OPERATOR'S PURCHASE ORDERS OR OTHER DOCUMENTS.**

**360 SYSTEMS' SOLE LIABILITY UNDER THIS LIMITED WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF ANY DEFECTIVE PRODUCT OR ITS COMPONENTS DURING THE WARRANTY PERIOD. IN NO EVENT SHALL 360 SYSTEMS, ITS DIRECTORS, OFFICERS, EMPLOYEES OR REPRESENTATIVES BE LIABLE FOR DIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INDIRECT DAMAGES, LOSS OF PROFITS, INCONVENIENCE OR ANY OTHER LOSSES DUE TO THE PRODUCT OR ITS OPERATION, OR ITS FAILURE TO OPERATE IN ACCORDANCE WITH ITS SPECIFICATIONS.**

Some states or regions do not allow the exclusion or limitation of incidental or consequential damages under certain circumstances, so the above limitations and exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state or region to region.

# End User License Agreement

## For Server Software

### IMPORTANT

THIS IS A LEGAL AGREEMENT BETWEEN YOU (“YOU”) AND 360 SYSTEMS® (“COMPANY”). COMPANY IS WILLING TO LICENSE THE SERVER SOFTWARE TO YOU ONLY UPON THE CONDITION THAT YOU ACCEPT ALL OF THE TERMS CONTAINED IN THIS SOFTWARE LICENSE AGREEMENT (“AGREEMENT”). PLEASE READ THE TERMS CAREFULLY BEFORE OPENING THIS PACKAGE, OR IF DOWNLOADED, BEFORE INSTALLING THE SOFTWARE, AS OPENING THE PACKAGE, OR IN THE CASE OF DOWNLOADED SOFTWARE, INSTALLING IT, WILL INDICATE YOUR ASSENT TO THEM. IF YOU DO NOT AGREE TO THE LICENSE TERMS, THEN COMPANY IS UNWILLING TO LICENSE THE SOFTWARE TO YOU, IN WHICH EVENT YOU MAY RETURN THE UNOPENED SOFTWARE PACKAGE TO THE PLACE FROM WHICH IT WAS ACQUIRED WITHIN 14 DAYS OF THE DATE OF PURCHASE AND YOUR MONEY WILL BE REFUNDED. IF YOU ARE VIEWING THIS AGREEMENT ELECTRONICALLY, SELECT THE “ACCEPT” BUTTON AT THE BOTTOM OF THIS PAGE TO INDICATE YOUR ACCEPTANCE OF THE TERMS OF THIS AGREEMENT. IF YOU ARE NOT WILLING TO BE BOUND BY ITS TERMS, SELECT THE “DECLINE” BUTTON AT THE BOTTOM OF THIS PAGE AND THE REGISTRATION OR INSTALLATION PROCESS WILL NOT CONTINUE.

1. Company grants to You a non-exclusive license to use the server software program (the “Software”) and any accompanying documentation (“Documentation”) solely for your internal business needs pursuant the terms and conditions of this Agreement. The license to use the Software is conditioned upon Your compliance with the terms of this Agreement. You shall be solely responsible for installation of the Software.
2. Your use of the Software is limited to the licensing option set forth on your invoice. Each licensing option is defined as follows:  
Single User License. Software provided to You under this option may only be installed on any server owned or controlled by You, but in no event may it be used on more than one server at the same time.  
Multiple User License. Software provided under this option may be installed on more than one server owned or controlled by You, the maximum number of which is indicated on the purchase invoice for this Software.
3. You may not transfer the Software to another entity or person. Any such transfer terminates your license under this Agreement. You shall not modify, translate, reverse assemble or reverse compile in whole or in part the Software that is provided in object code. You may not rent, sell, time-share, lease, sublicense, transfer, publish, disclose, display, or otherwise make available the object code or copies thereof to others. You may not make copies of the object code except as provided herein. You shall not tamper with, bypass or alter any security features of the Software or attempt to do so.
4. This license is not a sale. Title, ownership rights, and intellectual property rights in and to the Software and Documentation shall remain with the Company. You agree to abide by the copyright laws and all other applicable laws of the United States, your country, and international law. You acknowledge that the Software design remains a confidential trade secret of Company. Failure to comply with the above restrictions will result in automatic termination of this license and will make available to Company other legal remedies. You may not disclose any of Company’s proprietary or trade secret information relating to the Software to any third party.

5. Company warrants that the Software will perform substantially in accordance with its Documentation. Your exclusive remedy for breach of this limited warranty and Company's entire liability shall be, in Company's discretion, either return of the price paid to Company by You for the Software, or repair or replacement of the Software after Software and Documentation are returned to Company with an applicable receipt. Company's warranty is void if failure of the Software has resulted from accident, abuse, modification or misapplication. COMPANY MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE SOFTWARE AND DOCUMENTATION, AND SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. COMPANY DOES NOT WARRANT THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED OR ERROR FREE.
6. TO THE MAXIMUM EXTENT PERMITTED BY LAW, IN NO EVENT SHALL COMPANY BE LIABLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES WHATSOEVER, INCLUDING ANY CLAIMS FOR LOST PROFITS, BUSINESS INTERRUPTION, LOST INFORMATION OR OTHER DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE SOFTWARE. IN ALL EVENTS, COMPANY'S SOLE OBLIGATION OR LIABILITY UNDER THIS LICENSE IS THE REPLACEMENT OR REPAIR OF THE SOFTWARE OR A REFUND OF THE PURCHASE PRICE.
7. You may terminate the license granted in Section 1 of this Agreement at any time by destroying or erasing your copy of the Software. Company may terminate this Agreement immediately and without notice if you fail to comply with any term or condition of this Agreement. In the event of termination of this Agreement, all the sections of this Agreement will survive except for Section 1.
8. This Agreement shall be governed by and construed in accordance with the laws of the State of California, U.S.A., without reference to conflicts of laws provisions or the 1980 U. N. Convention on Contracts for the International Sale of Goods and, as to matters affecting copyrights, trademarks and patents, by U.S. federal law. Any dispute with respect to this Agreement shall be brought and heard either in the California state courts located in Los Angeles County, California, or the federal district court for the Central District, Western Division, located in Los Angeles, California. In such event, the parties to this Agreement each consent to the *in personam* jurisdiction and venue of such courts. The parties agree that service of process upon them in any such action may be made if delivered in person, by courier service, by telegram, by facsimile or by first class mail, and shall be deemed effectively given upon receipt.
9. This Agreement sets forth the entire agreement between You and Company pertaining to the licensing of the Software, and supersedes in its entirety any and all written or oral agreements previously existing between the parties with respect to such subject matter. If any provision of this Agreement is held invalid or unenforceable, such provision shall be revised to the extent necessary to cure the invalidity or unenforceability, and the remainder of this Agreement shall continue in full force and effect. In the event of any conflict between any provision of this Agreement and applicable law, the provisions of this Agreement affected shall be modified to remove such conflict and permit compliance with such law, and as so modified this Agreement shall continue in full force and effect. This Agreement may not be assigned without the consent of Company.

# Appendix A

## Connector Specifications

### Audio XLR-3 Connector Pinout

Signals appearing on XLR connectors of the DXP-1, AXP-3 or AXP-4 multi-channel audio modules conform to the following wiring standard.

Pin	BALANCED ANALOG	AES/EBU DIGITAL
1	SHIELD (FRAME GROUND)	SHIELD (FRAME GROUND)
2	" + " OR HOT	DIGITAL +
3	" - " OR COMMON	DIGITAL -
SHELL	FRAME GROUND	FRAME GROUND

### Serial Control Connector Pinout

Pin	DB9-F Connector
1	GND
2	Transmit A (TX-)
3	Receive B (RX+)
4	GND
5	N/C
6	GND
7	Transmit B (TX+)
8	Receive A (RX-)
9	GND
Shell	Frame ground

## BNC Connectors

The following note applies to all video and Genlock connectors:

- A BNC connector used as an output has a 75-ohm source impedance.
- A BNC connector used as an input has a 75-ohm termination.

## GPIO Connectors

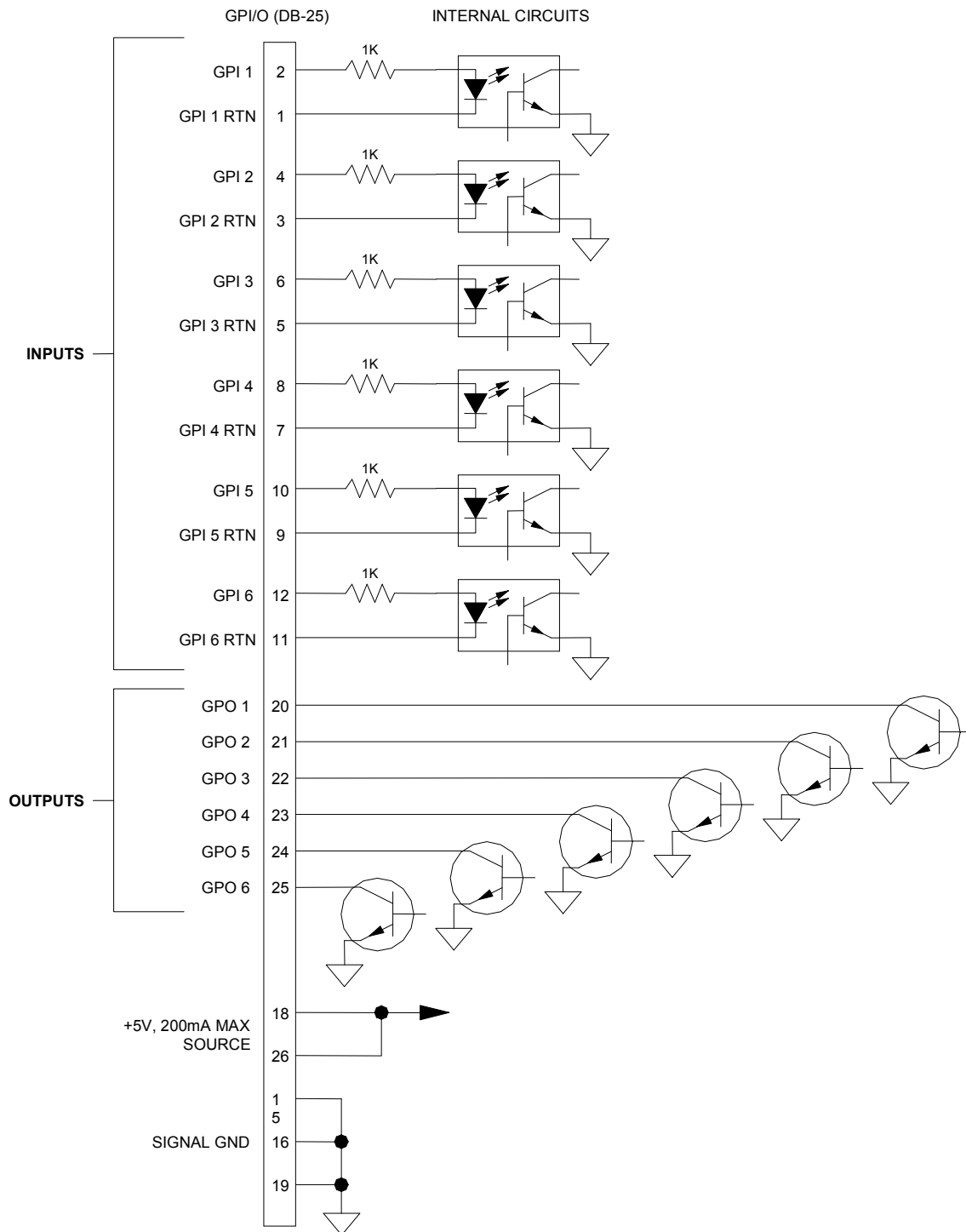
General purpose control inputs (GPI) may be applied to the GPIO connectors, which are DB-25 pin connectors. These inputs are optically isolated from the server circuitry; individual floating returns are provided. +5 volts may be sourced from pins 18 or 26, or provided from an external source. Current limiting devices are provided within the server.

General purpose status outputs also appear on the GPIO connectors. Open-collector outputs are provided as status outputs, and may be used to drive an external LED or control input.

Refer to the connector pin-out table and partial schematic, following. Inputs and outputs 1-6 are on connector 1, 7-12 are on connector 2, shown in parentheses. The schematic applies to both connectors as well.

## GPI Connector Pinout

Pin	Signal	Pin	Signal
2	GPI 1 (GPI 7)	1	GPI 1 RTN (GPI 7 RTN)
4	GPI 2 (GPI 8)	3	GPI 2 RTN (GPI 8 RTN)
6	GPI 3 (GPI 9)	5	GPI 3 RTN (GPI 9 RTN)
8	GPI 4 (GPI 10)	7	GPI 4 RTN (GPI 10 RTN)
10	GPI 5 (GPI 11)	9	GPI 5 RTN (GPI 11 RTN)
12	GPI 6 (GPI 12)	11	GPI 6 RTN (GPI 12 RTN)
13,14	N/C	17	N/C
15, 16, 19	GND	18, 26	+5V SOURCE (200 MA MAX)
20	GPO 1 (GPO 7)	21	GPO 2 (GPO 8)
22	GPO 3 (GPO 9)	23	GPO 4 (GPO 10)
24	GPO 5 (GPO 11)	25	GPO 6 (GPO 12)



**Figure 31: GPIO Connection Schematic**



## System Board Ports

Standard computer I/O ports on the server include video monitor, keyboard, mouse, and Gigabit Ethernet. Pinouts are provided to assist in wiring or trouble-shooting.

### Keyboard and Mouse

Keyboard and mouse ports are provided on the rear panel. Both ports are provided with a resettable fuse protecting the +5V supply to the peripheral.

### SVGA Ports

An SVGA computer monitor may be connected to the 15-pin video port. The server is pre-configured to an SVGA screen resolution of 1024 x 768 and 64,000 colors. The refresh rate will auto-negotiate with the attached monitor to achieve the best available value. This resolution is best viewed on 17-inch or larger monitors. Use only VESA compliant monitors. 360 Systems does not provide a monitor with the server.

### SVGA Connector Pinout

Pin	Signal	Pin	Signal
1	RED	9	+5V
2	GREEN	10	GND
3	BLUE	11	RESERVED*
4	RESERVED*	12	SDA
5	GND	13	HSYNC
6	RED RTN	14	VSYNC
7	GREEN RTN	15	SCL
8	BLUE RTN	SHELL	FRAME GROUND

\* Pulled high to +5V.

### Unused Ports

USB ports and an RS-232 serial port are present on the server. These are not active and no connection should be made to them. (USB ports may be used for software/firmware update devices only. There are no provisions for USB keyboard, mouse or mass storage devices, and their use may cause the server to operate improperly.)

# Appendix B

## Serial Command Protocols

### VDCP Command Table

The server responds to the following VDCP commands. Shaded areas indicate commands slated for future implementation.

COMMAND FROM CONTROLLER    RETURN FROM CONTROLLED DISK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
0X / 8X	15	Delete Protect ID		04	ACK
0X / 8X	16	Undelete Protect ID		04	ACK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
1X	00	Stop		04	ACK
1X	01	Play		04	ACK
1X	02	Record		04	ACK
1X	04	Still		04	ACK
1X	05	Step		04	ACK
1X	06	Continue		04	ACK
1X	07	Jog		04	ACK
1X	08	Varispeed Play		04	ACK
1X	0A	EE Mode		04	ACK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
2X / AX	1D	Rename ID		04	ACK
2X	1E	Preset Std. Time		04	ACK
2X / AX	1F	New Copy		04	ACK
2X	20	Sort Mode		04	ACK
2X	21	Close Port		04	ACK
2X	22	Select Port		04	ACK
2X / AX	23	Record Initialize		04	ACK
2X / AX	24	Play Cue		04	ACK
2X / AX	25	Cue with Data		04	ACK
2X / AX	26	Delete ID		04	ACK
2X / AX	2C	Record Init with Data		04	ACK
2X	30	Preset		04	ACK

<b>CMD-1</b>	<b>CMD-2</b>	<b>NAME</b>	<b>CMD-1</b>	<b>CMD-2</b>	<b>NAME</b>
3X	01	Open Port	3X	81	Grant/Denied
3X / BX	02	Next	3X	82	List of ID's
3X	05	Port Status Request	3X	85	State Status
3X	06	Position Request	3X	86	Position
3X / BX	07	Active ID Request	3X	87	Active ID
3X	08	Device Type Req.	3X	88	Device Type
3X	10	Syst. Status Request	3X	90	System Status
3X / BX	11	ID List	3X	91	List of ID's
3X / BX	14	ID Size Request	3X	94	ID Size
3X / BX	16	ID Request	3X	96	ID Presence
3X	17	Compression Settings Request	3X	97	Compression Settings
3X / BX	18	ID's Added List	3X	98	List ID's Added
3X / BX	19	ID's Deleted List	3X	99	List ID's Deleted

AX and BX versions are long-filename variants.  
 Macro commands (5X/DX in CMD-1) are not implemented.

## BVW Serial Command Table

The server command set includes most BVW-type commands. Commands not implemented include those for DMC operations, audio split and in/out points, and those specifically related to tape as a medium.

COMMAND	DESCRIPTION	RETURN	COMMENT
00.11	DEVICE TYPE REQUEST	ACK	
00.1D	LOCAL ENABLE	ACK	
00.0c	LOCAL DISABLE	ACK	
20.00	STOP	ACK	
20.01	PLAY	ACK	
20.02	RECORD	ACK	
20.10	FAST FORWARD	ACK	
2x.11	JOG FORWARD	ACK	
2x.12	VAR FORWARD	ACK	
2x.13	SHUTTLE FORWARD	ACK	
20.20	REWIND	ACK	
2x.21	JOG REVERSE	ACK	
2x.22	VAR REVERSE	ACK	
2x.23	SHUTTLE REVERSE	ACK	
20.30	PRE-ROLL	ACK	
20.0f	EJECT	ACK	
20.05	STANDBY ON	ACK	
20.60	FULL E-E OFF	ACK	
20.61	FULL E-E ON	ACK	
24.31	CUE UP WITH DATA	ACK	
40.08	TIMER 1 RESET	ACK	
40.10	IN ENTRY	ACK	
40.11	OUT ENTRY	ACK	
40.18	IN SHIFT +	ACK	
40.19	IN SHIFT -	ACK	
40.1A	OUT SHIFT +	ACK	
40.1B	OUT SHIFT -	ACK	
40.2D	LOST LOCK RESET	ACK	
41.36	TIMER MODE SELECT	ACK	
41.37	INPUT CHECK	ACK	
44.00	TIMER 1 PRESET	ACK	
44.04	TIME CODE PRESET	ACK	
44.31	PRE-ROLL TIME PRESET	ACK	
41.33	SERVO REFERENCE SELECT	ACK	
N/A	TIMER MODE STATUS	ACK	
7x.20	STATUS DATA	7x.20	
N/A	COMMAND SPEED SENSE	71.2E	
40.48	REF VIDEO SELECT ON	ACK	
40.49	REF VIDEO SELECT OFF	ACK	
6x.0E	CURRENT TIME SENSE	ACK	

ACK = 10.01 NAK = 11.12.xx

## Odetics® Protocol

Odetics serial protocol is an extension of BVW machine control protocol. Among its most significant features is the selection of a file by name rather than by time-code location, as with BVW. Odetics protocol is used by many table-top controllers and some automation systems.

**Note that the Odetics protocol only supports clip names up to 8 characters. Longer clip names are automatically filtered out from responses by the server.**

ACK = 0X1001

COMMAND	DESCRIPTION	RETURN	COMMENT
0X1001	ACK		
0x000C	LOCAL DISABLE	ACK	
0X0011	DEVICE TYPE	0X1211	BVW-75
0x001D	LOCAL ENABLE	ACK	
0x2000	STOP	ACK	
0x2001	PLAY	ACK	
0x2002	RECORD	ACK	
0x2004	STAND BY OFF	ACK	
0x2005	STAND BY ON	ACK	
0x200D	DMC START	ACK	COMMAND HAS NO EFFECT
0x200F	EJECT	ACK	
0x2010	FAST FORWARD	ACK	
0x2X11	JOG FORWARD	ACK	
0x2X12	VAR FORWARD	ACK	
0x2X13	SHUTTLE FORWARD	ACK	
0x2020	REWIND	ACK	
0x2X21	JOG REVERSE	ACK	
0x2X22	VAR REVERSE	ACK	
0x2X23	SHUTTLE REVERSE	ACK	
0x2030	PREROLL	ACK	
0x2X31	CUE UP	ACK	
0x2X38	PROG SPEED PLAY PLUS	ACK	
0x2X39	PROG SPEED PLAY MINUS	ACK	
0x2052	TENSION RELEASE	ACK	COMMAND HAS NO EFFECT
0x2054	ANTI CLOG TIMER DISABLE	ACK	COMMAND HAS NO EFFECT
0x2055	ANTI CLOG TIMER ENABLE	ACK	COMMAND HAS NO EFFECT
0x2X5C	DMC SET FORWARD	ACK	COMMAND HAS NO EFFECT
0x2X5D	DMC SET REVERSE	ACK	COMMAND HAS NO EFFECT
0x2060	FULL EE OFF	ACK	
0x2061	FULL EE ON	ACK	

COMMAND	DESCRIPTION	RETURN	COMMENT
0x4X00	TIMER1 PRESET	ACK	
0x4X04	TIME CODE PRESET	ACK	
0x4008	TIMER1 RESET	ACK	
0x4010	IN ENTRY	ACK	
0x4011	OUT ENTRY	ACK	
0x4X14	IN PRESET	ACK	
0x4X15	OUT PRESET	ACK	
0x4018	IN SHIFT PLUS	ACK	
0x4019	IN SHIFT MINUS	ACK	
0x401A	OUT SHIFT PLUS	ACK	
0x401B	OUT SHIFT MINUS	ACK	
0x4020	IN RESET	ACK	
0x4021	OUT RESET	ACK	
0x402D	LOST LOCK RESET	ACK	
0x4X30	EDIT PRESET	ACK	COMMAND HAS NO EFFECT
0x4X31	PRE-ROLL TIME PRESET	ACK	
0x4X32	TAPE AUTO SELECT	ACK	
0x4X33	SERVO REFERENCE SELECT	ACK	
0x4X34	HEAD SELECT	ACK	COMMAND HAS NO EFFECT
0x4X35	COLOR FRAME SELECT	ACK	COMMAND HAS NO EFFECT
0x4X36	TIMER MODE SELECT	ACK	
0x4X37	INPUT CHECK	ACK	
0x4040	AUTO MODE OFF	ACK	
0x4041	AUTO MODE ON	ACK	
0x4046	VARIABLE MEMORY OFF	ACK	
0x4047	VARIABLE MEMORY ON	ACK	
0x4048	VIDEO REFERENCE DISABLE OFF	ACK	COMMAND HAS NO EFFECT
0x4049	VIDEO REFERENCE DISABLE ON	ACK	COMMAND HAS NO EFFECT
0x4X70	VIDEO INPUT SELECT	ACK	
0x4X91	OUTPUT VIDEO LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X92	OUTPUT SETUP BLACK LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X93	OUTPUT CHROMA LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X98	OUTPUT H PHASE	ACK	COMMAND HAS NO EFFECT
0x4X99	OUTPUT SC PHASE	ACK	COMMAND HAS NO EFFECT
0x4X9A	OUTPUT VIDEO HUE	ACK	COMMAND HAS NO EFFECT
0x6X0A	TC GEN DATA SENSE		
	GEN TIME DATA	0X7408	

COMMAND	DESCRIPTION	RETURN	COMMENT
	GEN UB DATA	0X7409	
	GEN U BAND TC DATA	0X7809	
0x600C	CURRENT TIME SENSE		
	CORRECTED LTC TIME DATA	0X7414	
	VITC TIME DATA	0X7406	
	TIMER1 DATA	0X7400	
	HOLD USER BITS LTC DATA	0X7415	
	HOLD USER BITS VITC DATA	0X7416	
0x6010	IN DATA	0X7410	
0x6011	OUT DATA	0X7411	
0x6012	A IN DATA	NAK	
0x6013	A OUT DATA	NAK	
0x6020	STATUS DATA	0X7420	
0x6X23	SIGNAL CONTROL DATA	0X7423	
0x602E	COMMAND SPEED DATA	0X712E	
0x602F	VAR MEM SPEED DATA	0X712F	
0x6X30	EDIT PRESET DATA	NAK	
0x6031	PREROLL TIME DATA	0X7431	
0x6036	TIMER MODE STATUS	0X7136	
0xA001	AUTO SKIP	ACK	ODETICS COMMAND
0XAX02	CUE UP TO RECORD	ACK	ODETICS COMMAND
0XAX04	PREVIEW IN PRESET	ACK	ODETICS COMMAND
0XAX05	PREVIEW OUT PRESET	ACK	ODETICS COMMAND
0XA006	PREVIEW IN RESET	ACK	ODETICS COMMAND
0XA007	PREVIEW OUT RESET	ACK	ODETICS COMMAND
0XAX10	ERASE ID	ACK	ODETICS COMMAND
0XA014	LIST FIRST ID	0X8814	ODETICS COMMAND
0XA015	LIST NEXT ID	0X8814	ODETICS COMMAND
0XAX18	ID STATUS REQUEST	0X8818	ODETICS COMMAND
0XA01C	MAXIMUM STORAGE LENGTH	0X891C	ODETICS COMMAND
0XAX20	SET DEVICE ID	ACK	ODETICS COMMAND
0XA021	DEVICE ID REQUEST	0X8821	ODETICS COMMAND
0XCX01	JUMP FORWARD X FRAMES	ACK	ODETICS COMMAND
0XCX02	JUMP BACK X FRAMES	ACK	ODETICS COMMAND
0XCX03	GET LOADED ID	ACK	ODETICS COMMAND



# Appendix C

## Technical Specifications

<b>Video</b>	
Video Input	2 Channel
Video Outputs	4 Channels (2 are bidirectional)
HD Input/Output	HD-SDI, SMPTE 292M
Monitoring Outputs	Letterboxed composite video
HD Video Formats	1080i or 720p at 59.94 or 50 fps
Video Encoding	JPEG-2000 to 125 Mb/Sec
Jog/Shuttle	Zero to 255X, forward/reverse
Slow Motion Play with audio	Zero to 2X, forward/reverse
Channel Ganging	2, 3 or 4 -channel synchronized playback for key & fill or multi-screen display
<b>Audio</b>	
Embedded Audio	8 channels – SMPTE 299M (per video channel)
DXP-1 Multi-channel AES/EBU Module	Optional accessory. 8 AES/EBU digital audio channels per video input or output. (4 AES/EBU pairs) XLR-3 connectors
AXP-3 Multi-channel Analog Audio Module	Optional accessory. 4 analog audio channels (#1 thru 4) per video input or output. Balanced, +4 dBu, XLR-3 connectors
AXP-4 Multi-channel Analog Audio Module	Optional accessory. 4 analog audio channels (#5 thru 8) per video input or output. Balanced, +4 dBu, XLR-3 connectors. For use with AXP-3 module.
DXP-1, AXP-X dimensions	3½" x 19" x 5¼" [90 x 483 x 133mm] HWD. Weight: 8 lb [3.6 kg]
<b>Program Storage</b>	
Disk Storage System	12 Terabyte Serial ATA array, 12 drives, RAID-6
Storage time	240 hours approx. @ 80 Mb/sec
Drive Replacement	Front panel access
Software upgrades	CD-ROM or USB key
<b>Network Connectivity</b>	
File import/export	JPEG-2000 files via FTP
Remote GUI	PC w/ Remote Workstation software
As-Run Logs	Ethernet transfer
Diagnostics	Download of sequential events
<b>Miscellaneous</b>	
Serial Control	VDCCP, BVW, Odetics; 9-pin D
GPI	12 opto-isolated inputs, 12 open-collector outputs, 2 x 25-pin D
VBI & Ancillary Data	User selectable VANC. Any 6 lines within lines 8-22 (cc, AFD, etc)
Genlock Input	SMPTE 170M; PAL: ITU-R BT.470 (blackburst)
Fault Monitoring LEDs	Front Panel LEDs: power, genlock, fans, system, RAID status
Fault Monitoring Output	Fault outputs on GPO
Operating Systems	Linux®
<b>Power &amp; Mechanical</b>	
Power Supply	100-240 V, 50/60 Hz, 400 W. Dual, modular, redundant
Mechanical	Rack mounting: 3.5" x 19" x 18.5" (90 x 483 x 470 mm) HWD.
Cooling	Multiple fans
Weight	Approx 100 lbs (45 Kg) net
Agency Approvals	UL, C-UL, FCC Class A, CE, RoHS
Country of Origin	Made in U.S.A.

## Keyboard Shortcuts

Transport Control		Edit Operations	
<b>L</b>	Forward at 4x, 16x, 64x, 128x	<b>E</b>	Enter/Exit Edit Mode
<b>K</b>	Pause (Stop)	<b>I</b>	Capture Mark In
<b>J</b>	Reverse at 4x, 16x, 64x, 128x	<b>O</b>	Capture Mark Out
<b>Space Bar</b>	Play/Pause (toggle)	<b>Shift + R</b>	Review Edit
<b>R</b>	Record	<b>Shift + T</b>	Review Tail
<b>Home</b>	GoTo Head point		
<b>End</b>	GoTo Tail point		
<b>Shift + E</b>	E/E Toggle		
<b>Shift + L</b>	Loop Toggle		
<b>Shift + C</b>	Local Toggle		
<b>Shift + J</b>	Eject Clip		
<b>Right Arrow</b>	Jog forward 1 frame		
<b>Left Arrow</b>	Jog reverse 1 frame		
File Operations		Playlist	
<b>Ctrl + N</b>	New	<b>Home</b>	Recue
<b>Ctrl + O</b>	Open	<b>Space</b>	Play/Pause
<b>Ctrl + S</b>	Save	<b>K</b>	Stop
<b>Ctrl + A</b>	Save As		
<b>Ctrl + D</b>	Delete		
<b>Ctrl + R</b>	Rename		
Menu Operations		Playlist Edit	
<b>Alt + F</b>	Expands File Menu	<b>Shift + C</b>	Clear
<b>Alt + T</b>	Expands Transport Menu	<b>Left Arrow</b>	<< (Remove clip)
<b>Alt + C</b>	Expands Configure Menu	<b>Right Arrow</b>	>> (Add clip)
<b>Alt + P</b>	Expands Playlist Menu		
<b>Alt + W</b>	Expands Window Menu		
<b>Alt + H</b>	Expands Help menu		
		Navigating Between Channels	
		<b>Ctrl + &lt; number &gt;</b>	Switches to Transport Channel <number>
		<b>Alt + &lt; number &gt;</b>	Switches to Playlist Channel <number>
		Mark In/Mark Out Times (Edit Mode)	
		<b>&lt; number &gt;</b>	Inserts right justified number
		<b>DEL</b>	Removes last digit
		<b>ESC</b>	Aborts time code entry
		<b>. ; :</b> (any)	Shifts time code left
		<b>TAB</b>	Toggles between Mark In and Mark Out times

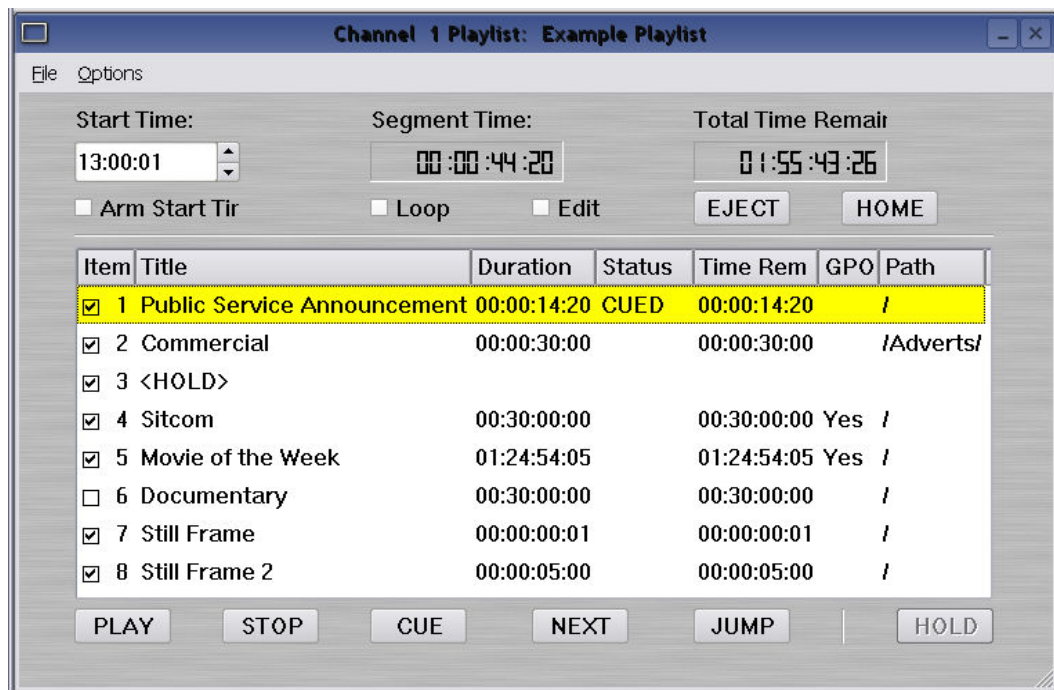
# Appendix D

## Playlist Management Detail

Playlists can be accessed via the server's FTP feature, allowing several capabilities:

- Lists can be backed up on a PC, and sent to another server.
- Lists can be viewed and printed from the PC
- Lists can be edited or created on the PC and uploaded to the server.

Playlists are found on the server FTP directory in the lists folder. They are simple text files with the extension .lst. Below is an example of a playlist as it appears in the GUI and its corresponding .lst file:



Playlist Example

```
#360PLAYLIST 2.0
#StartTime 13000100
#Loop 0

"/Public Service Announcement"
"/Adverts/Commercial"
"<HOLD>", HOLD
"/Sitcom", #1@0;10
"/Movie of the Week", #2@15;1000, #6@1245000;400
"/Documentary", SKIP
"/Still Frame"
"/Still Frame 2", frames=150
```

Each line of the example appears with its explanation below:

```
#360PLAYLIST 2.0
```

Header line, this must always be present exactly as shown.

```
#StartTime 13000100
```

This is the Start Time in military format, hours, minutes, seconds and frames, without leading zeros. This value shows 13:00:01 or 1 minute past 1 pm. The default is 0 which is 12 midnight. While frames are present in this value, the last two digits should always be "00" when entering any value except 0.

```
#Loop 0
```

This is the default, a looping list would show "#Loop 1".

```
"/Public Service Announcement"
```

This is the first clip in the list, named Public Service Announcement. It is enclosed in quotes, and preceded by a forward slash (/) which denotes that the clip is found in the root directory (i.e. it is not in a subfolder).

```
"/Adverts/Commercial"
```

This is the second clip, named Commercial. It is in the Adverts subfolder. Further levels of subfolder nesting would be shown as "/Folder/Subfolder/ClipName".

```
"<HOLD>", HOLD
```

This is a Hold event. The list will stop until it is restarted by command.

```
"/Sitcom", #1@0;10
```

This clip has a GPI Output event associated with it, in this case Output #1, at an offset of 1 frame, for a duration of 10 frames. Similar to Start Time values, GPI Output Offsets and Durations are represented as hours, minutes, seconds and frames without leading zeros. The format is:

<code>,#GPIOutputNumber@Offset;Duration</code>
--

```
"/Movie of the Week", #2@15;1000, #6@1245015;400
```

This clip has two GPI Output events, Output #2 @ 15 frames offset ; 10 seconds duration, and #6@1 hour 24 minutes 50 seconds 15 frames offset; 4 seconds duration.

```
"/Documentary", SKIP
```

This clip is skipped, this is programmed in the GUI by unchecking the check box for the event.

```
"/Still Frame"
```

Still frames appear the same as standard motion clips; the name of this clip is Still Frame.

```
"/Still Frame 2", frames=150
```

This still frame has a duration programmed. Unlike other time values, durations are frame counts. At 59.94 Hz, this is a 5 second duration. While it is possible to add a duration to a motion clip, this is not recommended. It is only allowed to specify fewer frames than the edited length of the clip (Mark In to Mark Out). You cannot make the clip "loop" by specifying a longer duration.

When opening Playlist files in a text editor, you may have to change the file type to "All Files" to be able to see files with the .lst extension.

Some text editors, such as Notepad, do not display each line separately. Word and Wordpad perform correctly because they accept files that have only Line Feeds (LF) at the ends of lines. The server will accept modified or externally created files with only LF or with both LF and Carriage Return (CR) at line endings. Do not use only CR without LF.

A list can be edited by:

- Changing the name of a clip: Clip names are case sensitive. Any clip name that does not match an existing clip will be reported as MISSING when the list is loaded on the server. This also applies to the name of a subfolder.
- Adding or deleting an event manually: Any of the available event types can be created.
- Modifying or adding to existing events: “, SKIP” “, frames = xx” or GPI Outputs can be added.
- Cutting and pasting the contents of one list into another, or duplicating sections of a list.

Save the file as a raw text file, and replace the .txt extension with .lst. File names should be limited to 31 characters.

When transferring .lst files via FTP, always specify Binary mode. Do not use ASCII or Auto.

# Appendix E

## As-Run Logging Detail

To enable As-Run logs, open a Playlist window, select Options, and then click on As-Run Logs. When enabled, a check mark will appear next to the As-Run log label, and files played by a playlist will be written to an As-Run log. Clips played in a transport window do not get written to an as-run log.

As-Run logs are available only through FTP downloads; they cannot be viewed or printed from the server itself. After logging into the server, select the ASRUN folder. All logs are stored in this location, and have the extension “.arl”.

## As-Run Naming Convention

The Naming convention for as-Run logs is as follows: **mmdd.c\_xxxx.n.arl**

<b>mm</b>	month ( 01 through 12 )
<b>dd</b>	Day ( 01 through 31 )
<b>c</b>	Channel ( 1 through 3 )
<b>xxxx</b>	Name of Playlist
<b>n</b>	Instance Count
<b>arl</b>	file extension

## Sample As-Run Log

IS-76152 as-run (Ch2:KQRS) Engr Wed Feb 02, 2009 [Wednesday PM] Pg 1

1	10:54:40	00:00:05:00	KRBE ID - Legal	PLAYED OK
2	10:54:45	00:00:30:00	Cellular One – Talk Time	PLAYED OK
3	10:55:15	00:00:30:00	Burger Stop – 2 for 1	PLAYED OK
4	10:55:45	00:00:15:00	Promo – Friends - Today	PLAYED OK
5	10:56:00	00:00:30:00	Bank of America – Gold Years	PLAYED OK
6	10:56:30	00:07:18:05	RICKI WEDNESDAY – SEG 1	PLAYED OK

Periodically, old logs should be deleted using the Delete command on your FTP client software.

## As-Run Log Page Header

This section describes the format of the first line (page header):

**IS-76152 as-run (Ch2:KQRS) Engr Wed Feb 02, 2009 [Wednesday PM] Pg 1**

**IS-76152:** IS-XXXXX, where XXXXX is the unique machine ID as shown in Help > About > Unit ID.

**as-run (Ch2:KQRS):** ChX is the channel number and KQRS is the name of the specific channel, as defined in the Configuration System window.

**Engr:** The name of the server, as defined in the Configuration System window.

**Wed Mar 30, 2009:** The base date to which clip times are referenced.

**[Wednesday PM]:** The name of the playlist

**Pg 1:** The page number of the printout.

## As-Run Log Body

This section describes the format of the body of an As-Run log:

**2 10:54:45 00:00:30:00 Cellular One – Talk Time PLAYED OK**

**2:** The line number (order) of the clip as it appears in the playlist. The same clip could have multiple numbers as files are added or deleted.

**10:54:45** The time at which the clip was played in HH:MM:SS, on a 24-hour clock.

**00:00:30:00** The length of the clip in HH:MM:SS.FF, on a 24-hour clock.

**Cellular One – Talk Time:** The name of the clip.

**PLAYED OK:** The status of the played clip.

Other possible status conditions are:

**CLIPPED** - Less than the full length played.

**SKIPPED** – The clip was skipped over because it was deselected (unchecked) or playback was order was modified by CUE or JUMP

**STOPPED** – The clip was stopped during playout.

# Appendix F

## Mechanical Drawing

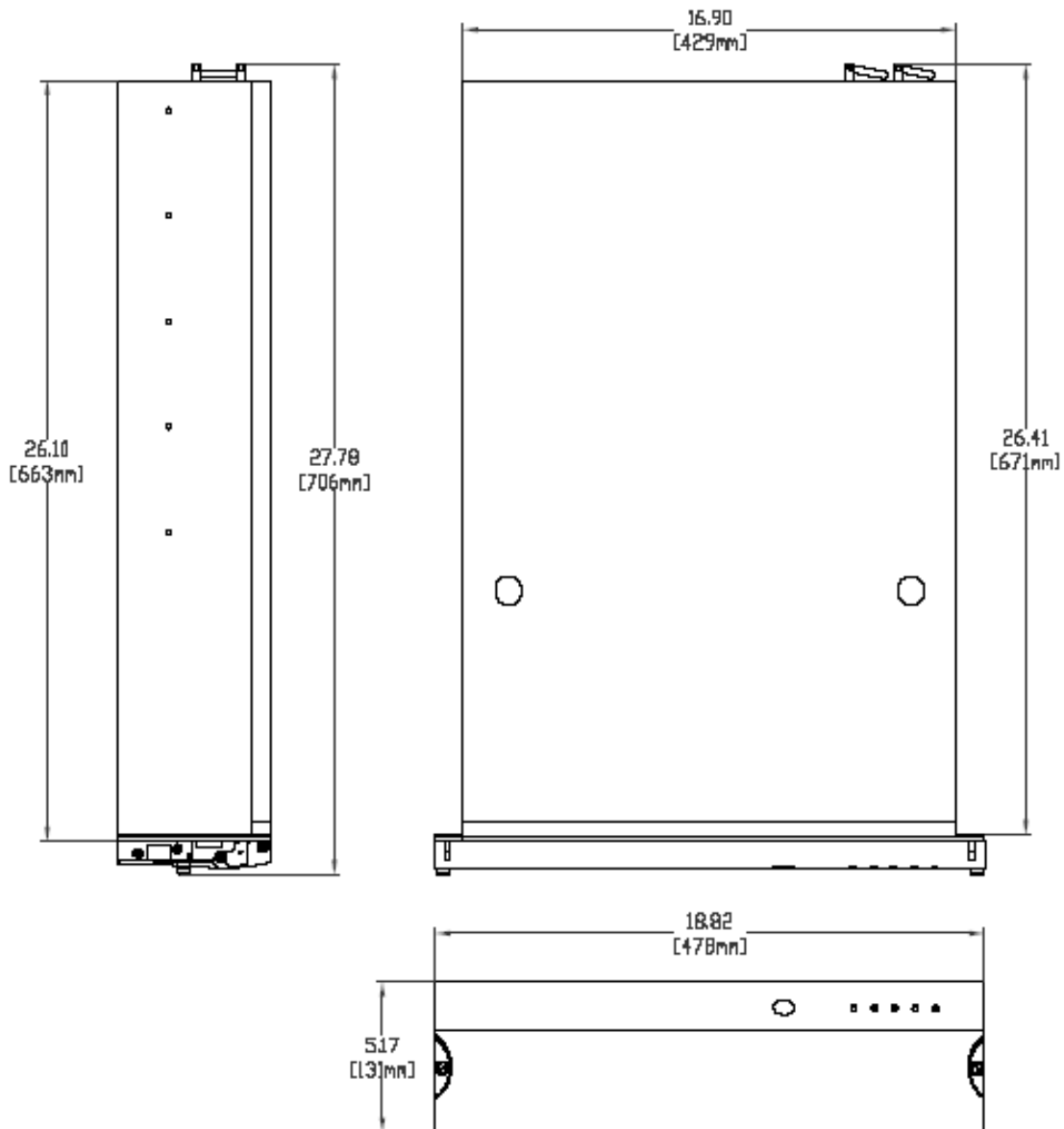


Figure 32: Dimensional Drawing



# Index

360 Systems	
Customer Service.....	114
E-mail .....	114
Fax.....	114
Telephone.....	114
Website .....	114
3D Playback.....	72
About RAID 6.....	93
Address, 360 Systems.....	114
AES/EBU.....	119
Animation Import.....	73
Appending a Playlist.....	67
Applications.....	16
Arming the Audio tracks.....	40
As-Run	
Enabling.....	66
As-Run logs .....	134
As-Run Logs .....	78
.arl files.....	78
Assigned Serial Ports .....	87
Assigning Names to the Server and Transport	
Channels.....	51
Audio	
Embedded.....	71
Audio Delay Time	
Setting.....	40
Audio Input Source	
Setting.....	40
Audio Rate Conversion .....	41
Audio Sample Rate Conversion .....	71
Audio Sync Reference .....	41
Auto E-E Mode .....	44, 87
Automation Control.....	83
Automation Protocol .....	84
Available Models .....	17
AXP Analog Audio Modules.....	105
AXP Module	
Mounting.....	22
AXP Technical Specifications .....	106
Bit-for-Bit®.....	41
Button	
<, >  .....	47
<->  .....	50
->  .....	50
E-E .....	44
FF .....	47
GoTo .....	47
Jog - .....	47
Jog + .....	47
Mark In Point.....	49
Mark Out Point .....	50
Review Clip.....	50
Review Out Point .....	50
Rew .....	47
Cascade Windows .....	31
Channel Ganging.....	72
Channel View	
Playlist.....	35
Transport .....	33
Clip Navigator.....	57
Clips	
Deleting .....	57
Filtering display .....	57
Locating.....	58
Renaming .....	57
Sorting.....	57
Configuring the Network .....	54
Connector Pinout	
Audio XLR-3 .....	119
GPI .....	120
Serial Control.....	119
SVGA .....	122
Connectors	
BNC .....	120
Specifications .....	119
Control Ports	
Priority.....	84
Serial .....	28, 83
Crash Recording.....	43
CUE .....	65
Cue Shows 1st Frame.....	86
Cue with Offset (vs. Timestamp) .....	86
Customer Service.....	114
CXP Module	
connections .....	27
Mounting.....	22
Date and Time .....	56
Deleting Clips .....	57
Disk Array	
Managing .....	94
Repair.....	94
Dolby-E.....	41
Drawing	
Mechanical.....	136
Drives	
LED .....	107
Duration Display .....	50
DXP-2 Digital Audio Module .....	104
DXP-2 Technical Specifications.....	105
Edit Menu .....	31
Editing	
Clip .....	49

While Recording.....	49	JPEG-200 File Format .....	77
E-E Mode.....	44	Key Features .....	15
Eject.....	47	Keyboard .....	25, 122
Embedded Audio .....	71	Keyboard Connection .....	23
Ethernet Cable.....	75	Keyboard Shortcuts .....	130
Ethernet Ports		KVM Switch.....	23
Gigabit.....	25	LED Indicators.....	107
EULA.....	117	Loop .....	46
Fans LED .....	107	LTC Time Code	
Fast Forward / Rewind Buttons .....	47	Input.....	25
Fault Diagnostics.....	107	Output.....	25
LEDs .....	107	Main Menu .....	30
File Menu.....	35	Maintenance .....	107
in Transport View .....	33	Maintenance Spares .....	17
File Types Supported.....	77	Making a Recording.....	39
Filtering the Clip Display.....	57	Mark In Point Button.....	49
Finding Clips.....	58	Mark Out Point Button.....	50
Using Regular Expressions .....	59	Mechanical Concerns .....	109
Using Wildcards .....	58	Mechanical Drawing.....	136
Firmware Updates from USB Memory.....	112	Menu	
Front Panel		Main.....	30
Removing .....	108	Window .....	31
Front Panel Indicators.....	107	Monitor.....	25
FTP File Transfer.....	75	Connection.....	23
Genlock		Requirements .....	23, 25
LED.....	107	Mouse.....	25, 122
Signal Quality .....	37	Mouse Connection.....	23
Sync Reference .....	25, 37	mov files .....	73
GoTo Buttons.....	47	Multi-Channel .....	104
GPI Control.....	28	Network	
GPO.....	68	Cable.....	75
Graphics and Animation .....	73	DHCP.....	55
Halt.....	29, 95	Disabling.....	54
Handling Precautions .....	109	saving Configuration.....	55
Hard Drives		Transfer Marked Segment .....	77
Installation .....	23	Transfer Rate.....	76
Replacement.....	114	Network Time Protocol.....	79
Replacing.....	102	NTP .....	79
Ignore Preroll Commands.....	87	Odetics	
Image Server		Serial Control.....	83
Models.....	17	Odetics® Protocol .....	126
Video In.....	25	On-Screen	
Video Out.....	25	Main Menu.....	30
In Point Display.....	49	Operations.....	29
Initial System Configuration .....	37	Options Menu	
Inputs		Playlist View.....	36
Video.....	25	Transport View .....	34
Installation .....	18	Out Point Display .....	50
Installing/Removing		Outputs	
I/O Cards .....	109	Video.....	25
Introduction .....	12	P2	
Jog Buttons.....	47	Command Table.....	125
JPEG 2000 (.jpv)		Serial Control.....	83
JPEG-200 File Format .....	77	Pause .....	46

Pinout		Schematic	
GPIO .....	121	GPIO .....	121
Playing A Clip .....	46	SDI .....	15, 25
Playlist .....	35, 78	Serial Control Ports .....	28
.lst files .....	78	Serial Port .....	26
Append .....	67	Serial Protocol	
Creating .....	63	Command Table .....	123
Editing .....	66	P2 .....	125
Editing Clip Duration .....	67	VDCP .....	123
Hold .....	67	Service	
Home .....	65	Access .....	108
Jumping .....	65	Front Panel .....	108
Loading .....	64	Top Cover .....	108
Looping .....	65	Settings - RAID Controller .....	103
Management .....	131	Show First Frame .....	65
Mapping GPIO .....	68	Show Menu .....	31
Pausing .....	65	Shutdown .....	29, 95
Saving .....	64	Shuttle .....	47
Stopping .....	65	Slider Bar .....	47
Playlist Menu Bar .....	35	Slow Motion .....	47
Power Conditioning .....	19	Software License Agreement .....	117
Power Connector .....	26	Software Version .....	110, 111
Power LED .....	107	Sorting Clips .....	57
Program Updates from USB Memory .....	111	Specifications	
Programming GPIO Inputs .....	53	Connectors .....	119
Programming GPIO Outputs .....	52	Technical .....	129
Protocol .....	84	Status Bar .....	32
Quick Restart .....	29	Still Frames .....	74
Rack Mounting .....	22	Storage Capacity .....	12
Radio Interference Compliance .....	115	SVGA Connector Pinout .....	122
RAID		Symbols	
Controller Settings .....	103	Warning And Information .....	10
Fault Tolerance .....	93	Sync Reference	
Performance .....	93	Genlock .....	25, 37
Repair .....	94	Sync Source	
Rear Panel		Setting .....	37
Indicators .....	108	System Board Ports .....	122
Rear Panel Connections .....	24	System Configuration Options .....	37
Reboot .....	29	System Cooling .....	19
Recommended UPS Models .....	20	System LED .....	107
Record Configuration Options .....	39	System Menu Bar .....	31
Recording .....	39, 42	System Timing .....	70
Regular Expressions .....	59	Take Control .....	34
REGULATORY COMPLIANCE .....	115	TARGA (.tga) files .....	78
Remote Workstation Interface .....	89	TARGA File Import .....	73
Renaming Clips .....	57	Tested Remote Control Panels, Switchers .....	88
Repair .....	114	Tile Windows .....	31
Replacing A Hard Drive .....	114	Time Code	
Report Play (vs Still) At End .....	86	LTC .....	25
Restart .....	29	Time Code Source	
Review Clip Button .....	50	Setting .....	42
Review Out Point Button .....	50	Top Cover	
RFI/EMI interference .....	20	Removing .....	108
Sample Rate Conversion .....	71	Transfer Rate	

Ethernet .....	76	Serial Control.....	83
Transport.....	33	Setting source directory .....	85
Transport Menu Bar.....	33	VDCP Options .....	86
Trouble Shooting.....	107	Video Bit Rate .....	39
Updating Firmware .....	112	Video Format Selection .....	38
UPS power conditioning .....	19	Video Inputs .....	25
USB.....	26	Video Outputs .....	25
Firmware Updates.....	112	Video Sync Source Setting .....	37
Program Updates .....	111	Warranty.....	116
VANC Line Selections .....	42	Windows Menu	
Vari-Play 0 Equals Pause .....	86	Cascade.....	31
Vari-Play 1X Equals Play.....	86	Tile .....	31
VDCP		Wiring	
Command Table .....	123	GPIO Schematic .....	121
Controllers.....	88		